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RELIABILITY ANALYSIS OF LARGE COMMERCIAL VESSEL ENGINE ROOM AUTOMATION SYSTEMS

VOLUME III
Appendices D - G

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<p>16. Abstract</p> <p>> This Volume III presents Appendices D through G. Appendix D contains the system failure effects summary and detailed failure modes and effects analysis for Ship C.</p> <p>Appendix E contains the Fault Tree diagrams for Ships A, B and C. Appendix F contains the individual criticality analysis summary sheets.</p> <p>Appendix G contains the computer printouts which were generated during the quantitative criticality analysis.</p>			
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METRIC CONVERSION FACTORS

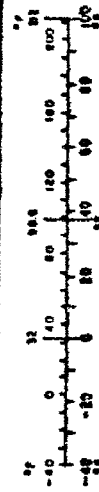
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
y	yards	0.9	meters	m
m	miles	1.6	kilometers	km
AREA				
sq in	square inches	6.5	square centimeters	cm ²
sq ft	square feet	0.09	square meters	m ²
sq yd	square yards	0.8	square meters	m ²
sq mi	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
lb	pounds	20	grams	g
oz	ounces	0.45	kilograms	kg
short tons (2000 lb)	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
cu in	cubic inches	16	milliliters	ml
cu ft	cubic feet	30	liters	l
cu yd	cubic yards	0.76	cubic meters	m ³
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
cu gal	cubic gallons	0.13	cubic meters	m ³
cu yd	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (also subtracting 32)	Celsius temperature	°C

For more information, see the Metric Conversion Tables, 1974 Edition, NIST Monograph 283, U.S. GPO, Washington, D.C. 20540, and 1975 Edition, NIST Monograph 283, U.S. GPO, Washington, D.C. 20540.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	1.6	miles	mi
mi	miles	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	sq in
m ²	square meters	1.2	square yards	sq yd
km ²	square kilometers	0.4	square miles	sq mi
ha	hectares (10,000 m ²)	2.5	acres	acres
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	short tons
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	1.1	quarts	qt
m ³	cubic meters	35	gallons	gal
m ³	cubic meters	1.3	cubic feet	cu ft
m ³	cubic meters	1.3	cubic yards	cu yd
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



APPENDIX D
SHIP C FAILURE MODE SUMMARIES AND
DETAILED FMEA

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SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
1.1 to 1.3 Control Transfer Logic

P.X	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P. 1	Propulsion system goes to idle; lose way on vessel.	1.1: 1B
P. 2	Lose all control capability from bridge and control transfers to bridge not possible.	1.1: 10B, 13B, 30A, 41A, 42A 1.2: 1B, 2A, 3B, 4B, 5A, 6
P. 3	Lose all control capability from ER and control transfers to ER not possible.	1.1: 11B, 14B, 33B, 40A 1.2: 9A, 10
P. 4	Lose all control capability from ER and local stations; control transfers to these stations not possible.	1.1: 10A, 42B 1.2: 3A, 4A
P. 5	Lose all control capability from bridge and ER; control transfers to these stations not possible.	1.1: 39A, 43B, 44B
P. 6	Lose all control capability from bridge and local stations; control transfers to these stations not possible.	1.1: 11A
P. 7	Control could not be transferred to local station.	1.1: 38A, 43A, 44A 1.2: 7B
P. 8	Control erroneously transferred to bridge.	1.1: 34B

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
1.1 to 1.3 Control Transfer Logic

P.X	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.9	Two or more stations simultaneously in control.	1.1: 12, 13A, 14A
P.10	No station in control transfers possible.	1.1: 35, 36, 37B, 38B, 39B, 40B, 41B 1.2: 5B, 7A, 8, 9B
P.11	System comes up in indeterminate state at system start-up.	1.1: 29
P.12	Lose bridge or ER transfer buzzer.	1.1: 2A, 3A, 20A, 31B, 32A 1.3: 1B, 2B
P.13	False bridge or ER transfer buzzer.	1.1: 2B, 3B, 31A, 32B, 33A 1.3: 1A, 2A
P.14	Lose station in control lamp at 1 or more locations.	1.1: 4A, 5A, 6A, 7A, 8A, 23A, 24B, 28A 1.3: 3B, 4B, 5B, 6B, 7B
P.15	False station in control lamp at 1 or more locations.	1.1: 4B, 5B, 6B, 7B, 8B, 20B, 21A, 22B, 24A, 25A, 26B, 27A 1.3: 3A, 4A, 5A, 6A, 7A
P.16	Lose station in control transfer acknowledge lamp indication.	1.1: 9A 1.3: 8B
P.17	False station in control transfer acknowledge lamp indication.	1.1: 9B 1.3: 8A
P.18	Lose control transfer in process lamp indication at 1 or more stations.	1.1: 15A, 16B, 17B, 18B, 19B, 21B, 22A, 25B, 26A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
1.1 to 1.3 Control Transfer Logic

P.X	SYSTEM FAILURE EFFECT	PMEA ITEM NO.
P.19	Premature lamp indication that control transfer process has been completed.	1.1: 15B, 16A, 17A, 18A, 19A
P. 0	No effect.	1.1: 1A, 27B, 28B, 30B, 34A, 37A 1.2: 1A, 2B

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.1 Propulsion system goes to idle; lose way on vessel.	2.1: 1B
P.2 One engine would shutdown.	2.1: 8A, 9A, 11B, 12A, 22B, 32A 2.2: 1, 52B, 55, 56B, 64, 65B 2.3: 4A, 5B, 6A, 7A, 8B
P.3 One engine would de-clutch.	2.1: 13B, 14B, 15B, 16A, 17A, 18B, 30B, 33A 2.3: 10B, 11A, 15B
P.4 One engine would shutdown when shutdown override not in effect.	2.1: 10A 2.2: 9, 10, 12B, 13B, 14B, 15, 16, 18B, 19B, 20B, 21, 22B, 23B, 24, 25B, 26B, 30B, 31B, 32B, 33, 34B, 35B, 39B, 40B, 41B, 42, 43B, 44A
P.5 One engine would de-clutch when bridge in control.	2.2: 69A
P.6 One engine would de-clutch when ER in control.	2.2: 67A
P.7 One engine would not shutdown if auto shutdown condition occurred. (Reduction gear L.O. pressure low, engine overspeed, etc.)	2.1: 10B, 11A, 12B, 22A 2.2: 56A 2.3: 7B, 8A
P.8 One engine could not be shutdown via emergency stop or engine stop P.B. switch.	2.1: 8B, 9B 2.2: 51, 52A, 65A 2.3: 4B, 5A, 6B
P.9 One engine could not be started.	2.1: 2A, 3B, 4B, 7A, 7B, 31B 2.2: 7A, 49, 50A, 53, 54B, 62, 63B, 60, 61A 2.3: 1B, 2B, 3B

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.10	One engine could be started when one or more permissives not met (J.W. pressure low, L.O. pressure low, etc.).	2.1: 2B, 3A 2.2: 12A, 13A, 14A, 18A, 19A, 20A, 22A, 23A, 25A, 26A, 27, 28, 30A, 31A, 32A, 34A, 35A, 36, 37, 39A, 40A, 41A, 43A, 44B
P.11	One engine could be started with its clutch engaged.	2.1: 31A 2.2: 61B
P.12	One engine could be started when an engine shutdown condition exists.	2.2: 50B
P.13	One engine could be started when its barring gear is engaged.	2.2: 54A
P.14	One engine could not be clutched in.	2.1: 21A, 23B, 24A 2.2: 8B, 48A, 58, 59B
P.15	One engine could not be clutched in from ER.	2.1: 19B 2.2: 70, 71B
P.16	One engine could not be clutched in from bridge.	2.1: 20B 2.2: 72, 73B
P.17	One engine could not be clutched in unless other engine is clutched in.	2.1: 28B
P.18	One engine could not be clutched in when the other engine is running.	2.1: 26B, 27A, 29B

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.19	One engine could not be de-clutched.	2.1: 14A, 15A, 18A, 28A, 29A, 30A, 33B 2.3: 10A, 11B, 15A
P.20	One engine could not be de-clutched from ER.	2.1: 17B 2.2: 66, 67B
P.21	One engine could not be de-clutched from bridge.	2.1: 16B 2.2: 68, 69B
P.22	One engine could be clutched in when one or more permissives not met.	2.1: 24B 2.2: 47, 48B
P.23	One engine could be clutched in without regard for engine speed.	2.1: 26A 2.2: 8A
P.24	One engine could be clutched in when reduction gear barring gear engaged.	2.2: 59A
P.25	One engine would stay clutched in following emergency stop.	2.1: 13A
P.26	One engine stays clutched in whenever the two engines are in sync.	2.1: 27B
P.27	One engine stays clutched in when ER in control.	2.2: 71A
P.28	One engine stays clutched in when bridge in control.	2.2: 73A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.29	One engine starts spontaneously.	2.1: 4A 2.2: 7B, 63A 2.3: 1A, 2A, 3A
P.30	Lose manual override of auto engine shutdown.	2.2: 45, 46A
P.31	Lose split mode operation capability.	2.1: 32B
P.32	Lose engine barring gear engaged annunciator.	2.1: 5B, 6B 2.3: 16B
P.33	False engine barring gear engine annunciator.	2.1: 5A, 6A 2.3: 16A
P.34	Lose reduction gear barring gear engaged annunciator.	2.1: 23B 2.3: 13B, 14B
P.35	False reduction gear barring gear engaged annunciator.	2.1: 23A 2.3: 13A, 14A
P.36	Lose engine RPM meter.	2.2: 2
P.37	Lose engine stop annunciator.	2.2: 3B, 4B
P.38	False engine stop annunciator.	2.2: 3A, 4A
P.39	Lose engine start annunciator.	2.2: 5B, 6B
P.40	False engine stop annunciator.	2.2: 5A, 6A
P.41	Lose P.O. pressure gauge.	2.2: 11

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.42	Lose P.O. pressure annunciator.	2.2: 13D
P.43	False P.O. pressure annunciator.	2.2: 13C
P.44	Lose engine L.O. pressure gauge.	2.2: 17
P.45	Lose engine L.O. pressure annunciator.	2.2: 19D
P.46	False engine L.O. pressure annunciator.	2.2: 19C
P.47	Lose rocker L.O. pressure annunciator.	2.2: 22D
P.48	False rocker L.O. pressure annunciator.	2.2: 22C
P.49	Lose J.W. pressure annunciator.	2.2: 25D
P.50	False J.W. pressure annuncia- tor.	2.2: 25C
P.51	Lose J.W. temperature gauge.	2.2: 29
P.52	Lose J.W. temperature annuncia- tor.	2.2: 31D
P.53	False J.W. temperature annun- ciator.	2.2: 31C
P.54	Lose inj. coolant pressure annunciator.	2.2: 34D

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.55	False inj. coolant pressure annunciator.	2.2: 34C
P.56	Lose inj. coolant temperature gauge.	2.2: 38
P.57	Lose inj. coolant temperature annunciator.	2.2: 40D
P.58	False inj. coolant temperature annunciator.	2.2: 40C
P.59	Lose reduction gear L.O. pressure annunciator.	2.2: 43D
P.60	False reduction gear L.O. pressure annunciator.	2.2: 43C
P.61	Lose CPP hydraulic pressure annunciator.	2.2: 48D
P.62	False CPP hydraulic pressure annunciator.	2.2: 48C
P.63	Lose engine overspeed annunciator.	2.2: 57B
P.64	False engine overspeed annunciator.	2.2: 57A
P.65	Lose engine shutdown annunciator.	2.3: 9B
P.66	False engine shutdown annunciator.	2.3: 9A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
2.1 to 2.3 Engine and Clutch Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.67	Lose shutdown reset indication.	2.3: 12B
P.68	False shutdown reset indication.	2.3: 12A
P.69	Lose clutch engaged indication.	2.3: 17B
P.70	False clutch engaged indication.	2.3: 17A
P.71	No effect.	2.1: 1A 2.2: 46B
P.72	One engine stays clutched in whenever permissives are met (flat pitch, thrust control at zero, etc.).	2.1: 19A, 20A, 21B, 25A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.1 Propulsion system goes to idle; lose way on vessel.	3.1: 1B, 4A, 12A, 13B, 15A 3.2: 15B, 16B 3.3: 12B, 14B, 16B, 18B, 20B, 29B, 29C
P.2 Same as #1 above except auto cruise mode only.	3.1: 18B
P.3 Same as #1 above except split mode only.	3.1: 19 3.2: 23 3.3: 24A, 24D
P.4 Same as #1 above except only when BR in control in maneuver mode.	3.1: 30, 32B 3.2: 21 3.3: 22C
P.5 Same as #1 above except only when bridge in control in maneuver mode.	3.1: 31, 34B 3.2: 20 3.3: 22A
P.6 Same as #1 above except only in maneuver mode.	3.3: 13B, 23B, 23C
P.7 Same as #1 above except only in cruise and maneuver mode.	3.3: 24B, 24C, 28C
P.8 Same as #1 above except only in 2-engine cruise mode.	3.3: 25A, 25D
P.9 Same as #1 above except only in 1-engine cruise mode.	3.3: 25E, 25H
P.10 Same as #1 above except only in 2-engine maneuver mode.	3.3: 25B, 25C

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.11	Same as #1 above except only in 1-engine maneuver mode.	3.3: 25F, 25G
P.12	Same as #1 above except only in 1-engine cruise and maneuver mode.	3.3: 28A
P.13	Lose auto pitch control when going AH.	3.2: 15A
P.14	Lose auto pitch control when going AS.	3.2: 16A
P.15	Lose auto pitch control when going AH and ER in control.	3.2: 17A, 19A
P.16	Same as #15 except when bridge in control.	3.2: 18A, 19C
P.17	Lose auto pitch control when going AS and ER in control.	3.2: 17B, 19B
P.18	Lose auto pitch control when going AS and bridge in control.	3.2: 18B, 19D
P.19	False full speed commands in auto-cruise mode.	3.1: 18A
P.20	False full speed commands in maneuver mode.	3.3: 13A
P.21	False full AH commands in 2-engine cruise mode.	3.3: 15A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.22	Same as #21 except in 2-engine maneuver mode.	3.3: 17A
P.23	Same as #21 except in 1-engine cruise mode.	3.3: 19A
P.24	Same as #21 except in 1-engine maneuver mode.	3.3: 21A
P.25	False full AS commands in 2-engine cruise mode.	3.3: 15B
P.26	Same as #25 except in 2-engine maneuver mode.	3.3: 17B
P.27	Same as #25 except in 1-engine cruise mode.	3.3: 19B
P.28	Same as #25 except in 1-engine maneuver mode.	3.3: 21B
P.29	Lower speed than commanded, 1-engine modes.	3.1: 17A
P.30	Lower speed than commanded, cruise mode.	3.1: 20 3.2: 22 3.3: 23A
P.31	Higher speed than commanded, 2-engine modes.	3.1: 17B
P.32	Uncommanded speed increases when ER in control.	3.1: 32A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.33	Uncommanded speed increases when bridge in control.	3.1: 34A
P.34A	Speed higher and/or lower than commanded--maneuver mode.	3.3: 13C
P.34B	Speed higher and/or lower than commanded--cruise mode.	3.3: 23D
P.35	Speed higher and/or lower than commanded when bridge in control	3.3: 22D
P.36	Speed higher and/or lower than commanded when BR in control.	3.3: 22B
P.37	Higher AH speed than commanded, 1-engine maneuver mode.	3.3: 21C
P.38	Higher AS speed than commanded, 1-engine maneuver mode.	3.3: 21D
P.39	Higher AH speed than commanded, 2-engine maneuver mode.	3.3: 17C
P.40	Higher AS speed than commanded, 2-engine maneuver mode.	3.3: 17D
P.41	Higher AH speed than commanded, 1-engine cruise mode.	3.3: 19C
P.42	Higher AS speed than commanded, 1-engine cruise mode.	3.3: 19D

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.43	Higher AH speed than commanded, 2-engine cruise mode.	3.3: 15C
P.44	Higher AS speed than commanded, 2-engine cruise mode.	3.3: 15D
P.45	Incorrect response to direction change commands--all 2-engine modes.	3.3: 28B
P.46	Same as #45 except 1-engine modes.	3.3: 28D
P.47	Lose all modes except auto-cruise mode; lose control if in any other mode at time of failure (vessel could speed-up or slow down).	3.1: 4B, 5B 3.2: 6B, 11, 12B
P.48	Same as #47 except lose all modes except split mode.	3.1: 6B, 8A 3.2: 10A
P.49	Lose split mode; lose control if split mode at time of failure (vessel could speed up or slow down).	3.1: 2A, 6A, 7B, 8B, 29 3.2: 9, 10B
P.50	Same as #49 except maneuver mode.	3.1: 2B, 3B, 7A 3.2: 7, 8A, 8B
P.51	Same as #49 except cruise mode.	3.1: 3A, 5A 3.2: 5, 6A

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SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

SYSTEM FAILURE EFFECT	FAEA ITEM NO.
P.52 Same as #49 except auto and maneuver mode.	
P.53 One engine goes to idle.	Port Engine: 3.3: 26A, 26C Stbd Engine: 3.3: 27A, 27C
P.54 One engine slows down.	Port Engine: 3.1: 24B Stbd Engine: 3.1: 25B
P.55 One engine could not be controlled via auto system.	Port Engine: 3.1: 23B 3.3: 27B Stbd Engine: 3.1: 22B 3.3: 26B
P.56 One engine speeds up.	Port Engine: 3.1: 24A Stbd Engine: 3.1: 25A
P.57 One engine speeds up when engine not in use.	Port Engine: 3.1: 23A Stbd Engine: 3.1: 22A
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P.60 Port idle cannot be commanded from bridge and/or ER.	3.1: 12B, 13A, 14B 3.2: 1, 2A, 3, 4A
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SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
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P.63	One engine could be clutched in without regard for engine speed.	3.1: 16B
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P.67	Lose SDG Not on Line lamp indication.	3.1: 9D 3.2: 13, 14A 3.3: 6B, 7B, 8B, 9B
P.68	False SDG Not on Line lamp indication.	3.1: 9A, 9B, 9C 3.2: 14B 3.3: 6A, 7A, 8A, 9A
P.69	Lose cruise mode indicator at one or more locations.	3.1: 11A 3.3: 3B
P.70	False cruise mode indication at one or more locations.	3.1: 11B 3.3: 3A

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.71	Lose speed fail alarm.	3.1: 21B, 27A 3.2: 25A, 26A 3.3: 1B
P.72	False speed fail alarm.	3.1: 21A, 26, 27B 3.2: 24, 25B, 26B 3.3: 1A
P.73	Lose control fail alarm.	3.1: 28A 3.3: 2B
P.74	False control fail alarm.	3.1: 28B 3.3: 2A
P.75	ER throttle position indicator incorrect.	3.1: 33 3.3: 10
P.76	Bridge throttle position indicator incorrect.	3.1: 35 3.3: 11
P.77	Lose maneuver mode indicator at one or more locations.	3.3: 4B
P.78	False maneuver mode indicator at one or more locations.	3.3: 4A
P.79	Lose split mode indicator at one or more locations.	3.3: 5B
P.80	False split mode indicator at one or more locations.	3.3: 5A
P.81	Lose port idle indication.	3.3: 26E, 26H, 27E, 27H

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
3.1 to 3.3 Mode Control

	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.82	False port idle indication.	3.3: 26F, 27F
P.83	No effect.	3.1: 1A 3.3: 1C, 2C, 8C, 12A, 14A, 16A, 15E, 17E, 18A, 19E, 20A, 21E, 26D, 26G, 27D, 27G

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
4.1 TO 4.5 Pitch Control

P.X	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.1	Propulsion system goes to idle; lose way on vessel.	4.1: 1B, 21A, 22B, 23A
P.2	Same as #1 except in cruise and maneuver modes only.	4.1: 12A, 13A
P.3	Same as #1 except in split mode only.	4.1: 11B, 24 4.2: 3
P.4	Vessel slowdown.	4.4: 2A, 3B, 4B, 6A, 7A 4.5: 1A, 2A, 3A, 4A
P.5	False full AH command.	4.1: 2A, 4A, 7A, 9A, 10A, 17A 4.4: 5C
P.6	False full AS command.	4.1: 2B, 4B, 7B, 9B, 10B, 16B 4.4: 5A
P.7	Same as #5 except in split mode only.	4.1: 8A
P.8	Same as #6 except in split mode only.	4.1: 8B
P.9	Lose ability to go AH.	4.4: 5D
P.10	Lose ability to go AS.	4.4: 5B
P.11	Lose automatic pitch control in split mode.	4.1: 8C
P.12	Crash astern rates too slow.	4.1: 2D, 6A, 14A 4.2: 4B

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
4.1 TO 4.5 Pitch Control

P.X	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.13	Uncommanded pitch changes in non-split mode if split pot not left at zero position.	4.1: 11A
P.14	Uncommanded pitch changes in split mode if any throttle lever not left at zero position.	4.1: 12B, 13B
P.15	Pitch changes not inhibited if vessel not underway.	4.1: 21B, 22A, 23B
P.16	Clutch could be engaged when pitch not flat.	4.1: 18A 4.2: 5B
P.17	Clutch could not be engaged.	4.1: 18B 4.2: 5A
P.18	No auto pitch cutback if overload occurred on one or both engine(s).	4.4: 2B, 3A, 4A, 6B, 7B 4.5: 1B, 2B, 3B, 4B
P.19	Pitch changes occur at high rates.	4.1: 2C, 3A, 5A, 6B, 14B 4.2: 4A 4.3: 1A, 2B
P.20	Slow pitch change rates in manual.	4.1: 3B, 5B
P.21	Lose pitch position indicator at one or more locations.	4.1: 15 4.3: 4

SUMMARY OF SHIP C SYSTEM FAILURE EFFECTS
4.1 TO 4.5 Pitch Control

P.X	SYSTEM FAILURE EFFECT	FMEA ITEM NO.
P.22	Lose pitch fail alarm at one or more locations.	4.1: 19B, 20A 4.2: 1B, 2B 4.3: 3B
P.23	False pitch fail alarm at one or more locations.	4.1: 19A, 20B 4.2: 1A, 2A 4.3: 3A
P.24	Lose AH or AS indication on bridge wings.	4.2: 6B, 7B
P.25	False AH or AS indication on bridge wings.	4.2: 6A, 7A
P.26	Lose wrong direction pitch alarm at one or more locations.	4.2: 8, 9B, 9D
P.27	False wrong direction pitch alarm at one or more locations.	4.2: 9A, 9C
P.28	No effect.	4.1: 1A, 16A, 17B 4.3: 3C, 1B, 2C 4.4: 1A

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS. COMMENTS INDEX
1A	Filter Capacitors	Fail open.		No effect (some EMI filtering capability would be lost).	No effect.	0.1705
1B	Filter Capacitors	Fail short.		+5 volt power supply to all cards shorted to ground; lose all logic circuitry.	Engines would be forced to idle state and prop would go to neutral. Vessel would coast to a stop.	0.3279
2A	Bridge Transfer Buzzer* Output Circuit	Stays high.		Lose bridge transfer buzzer.	Buzzer would not alert bridge to control transfer request.	0.1004
2B	Bridge Transfer Buzzer* Output Circuit	Stays low.		Bridge transfer buzzer would sound continuously.	No effect unless bridge took wrong action which would create confusion as to who was in control and possibly result in no one being in control.	0.1004
3A	ER Transfer Buzzer* Output Circuit	Stays high.		Lose ER transfer buzzer.	Buzzer would not alert ER to control transfer request.	0.1004
3B	ER Transfer Buzzer* Output Circuit	Stays low.		ER transfer buzzer sounds continuously.	No effect unless ER took wrong action, which would create confusion as to who was in control and possibly result in no one being in control.	0.1004
4A	Bridge Control Lamp* Output Circuit	Stays high.		Bridge and ER "Bridge in Control" would not light steady nor flash.	Bridge and ER would lose lamp indicator that bridge had received control and that a control transfer was in process.	0.1004
4B	Bridge Control Lamp* Output Circuit	Stays low.		Bridge and ER "Bridge in Control" lamp would stay lit steady.	Bridge and ER would think bridge was in control; could create confusion and result in nobody exercising control.	0.1004
5A	ER in Control Lamp* Output Circuit	Stays high.		Bridge to ER "ER in Control" lamp would not light steady nor flash.	Bridge and ER would lose lamp indication that ER had received control and that a control transfer was in process.	0.1004
5B	ER in Control Lamp* Output Circuit	Stays low.		Bridge and ER "ER in Control" lamp would stay lit steady.	Bridge to ER would think ER was in control; could create confusion and result in nobody exercising control.	0.1004

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS.	COMMENTS INDEX
6A	Local in Control Lamp* on Bridge Output Circuit	Stays high.	"Local in Control" lamp on bridge would not light steady nor flash.	Bridge would lose lamp indication that local had received control and that a control transfer was in process.		0.1004	
6B	Local in Control Lamp* on Bridge Output Circuit	Stays low.	"Local in Control" lamp on bridge would stay lit steady.	Bridge would think that local was in control; could create confusion and result in nobody exercising control.		0.1004	
7A	Local in Control Lamp* in ER Output Circuit	Stays high.	"Local in Control" lamp in ER would not light steady nor flash.	ER would lose lamp indication that local had received control and that a control transfer was in process.		0.1004	
7B	Local in Control Lamp* in ER Output Circuit	Stays low.	"Local in Control" lamp in ER would stay lit steady.	ER would think that local was in control; could create confusion and result in nobody exercising control.		0.1004	
8A	Local in Control Lamp* Output to Local Panel	Stays high.	"Local in Control" lamp on local panel would not light steady nor flash.	Local station would lose lamp indication that it had received control and that a control transfer was in process.		0.1004	
8B	Local in Control Lamp* Output to Local Panel	Stays low.	"Local in Control" lamp on local panel would stay lit steady.	Local would think that it was in control; could create confusion and result in nobody exercising control.		0.1004	
9A	Bridge Transfer Acknowledge P.B.* Output Circuit	Output stays high.	Transfer acknowledge P.B. lamp on bridge would never light nor flash.	Bridge would lose the lamp indication that it should depress the transfer acknowledge P.B. to complete the control transfer to the bridge cannot be accomplished until this P.B. is depressed.		0.1673	
9B	Bridge Transfer Acknowledge P.B.* Output Circuit	Output stays low.	Transfer acknowledge P.B. lamp on bridge stays lit steady.	Bridge might think it was supposed to depress the control transfer acknowledge P.B. although since the lamp would not be flashing bridge would probably recognize this as an incorrect indication.		0.1673	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REP. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
10A	Bit 0 Flip Flop	Stays reset.	Bit 0 would stay low.	Control not possible from ER or local panel; would not effect control from bridge.		0.6507	
10B	Bit 0 Flip Flop	Stays set.	Bit 0 would stay high.	Control not possible from bridge; would not effect control from ER or local panel.		0.6507	
11A	Bit 1 Flip Flop	Stays reset.	Bit 1 would stay low.	Control not possible from bridge or local panel; would not effect control from ER.		0.1004	
11B	Bit 1 Flip Flop	Stays set.	Bit 1 would stay high.	Control not possible from ER; would not effect control from bridge or local panel.		0.1004	
12	U21 BCD to Decimal Decoder	Any.	Depending on nature of failure (internal to IC chip); would cause either 1) loss of bridge in control, ER in control, and/or local in control signals or 2) any one of the 3 station-in-control signals remains erroneously active.	Depending on nature of failure, either 1) control would not be possible from 1 or more of the 3 stations, or 2) any 2 of the 3 stations could simultaneously exercise control.		1.0345	
13A	Bridge in Control Outlet Circuit	Stays high.	Bridge in control circuits stay enabled and bridge in control lamps at bridge and ER stay lit steady.	Bridge and either of the other 2 stations could be in control simultaneously.		0.1062	
13B	Bridge in Control Outlet Circuit	Stays low.	Bridge in control circuits stay inhibited and bridge in control lamps at bridge and ER never light steady (they would flash).	Same as #10B.		0.4075	
14A	ER in Control Output Circuit	Stays high.	ER in control circuits stay enabled and ER in control lamps at bridge and ER stay lit steady.	ER and either of the other 2 stations could be in control simultaneously.		0.1062	
14B	ER in Control Output Circuit	Stays low.	ER in control circuits stay inhibited and ER in control lamps at bridge and ER never light steady (they would flash).	Same as #11B.		0.1062	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
15A	Blink Circuit	Output stays high.	None of the station-in-control lamps would illuminate in the flashing mode to indicate that a control transfer was in process; lamps would stay dark during the transfer process.	Loss of control transfer in process indication via flashing lamp at all control stations.		0.1073	
15B	Blink Circuit	Output stays low.	All of the station-in-control lamps would illuminate steady when they should be flashing.	Control transfer process would appear to have been completed prematurely.		0.1073	
16A	Bridge in Control Blink Gate	Stays high.	Bridge in control lamps will illuminate steady when they should be flashing.	Control transfers involving bridge station would appear to have been completed prematurely.		0.1004	
16B	Bridge in Control Blink Gate	Stays low.	Bridge in control lamps will stay dark when they should be flashing.	Loss control transfer in process indication via flashing lamps at all control stations for transfers involving the bridge.		0.1004	
17A	ER in Control Gate	Stays high.	ER in control lamps will illuminate steady when they should be flashing.	Control transfers involving ER station would appear to have been completed prematurely.		0.1004	
17B	ER in Control Gate	Stays low.	ER in control lamps will stay dark when they should be flashing.	Loss control transfer in process indication via flashing lamps at all control stations for transfers involving ER.		0.1004	
18A	Local Control Blink Gate, Bridge Indication	Stays high.	Local in control lamp on bridge will illuminate steady when it should be flashing.	Control transfers involving local station would appear to the bridge to have been completed prematurely.		0.1004	
18B	Local Control Blink Gate, Bridge Indication	Stays low.	Local control lamp on bridge will stay dark when it should be flashing.	Loss control transfer in process indication via flashing lamp on bridge for transfers involving local station.		0.1004	
19A	Local Control Blink Gate, ER Indication	Stays high.	Local in control lamp in ER will illuminate steady when it should be flashing.	Control transfers involving local station would appear to ER to have been complete prematurely.		0.1004	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS.	COMMENTS INDEX
19A	Local Control Blink Gate, ER Indication	Stays low.		Local control lamp in ER and local station will stay dark when they should be flashing.	Lose control transfer in-process indications via flashing lamps in ER and at local panel for transfers involving local station.	0.1004	
20A	ER Transfer Flash and Buzzer Gate	Stays high.		Lose blink and buzz signals for transfers involving ER.	Lose flashing lamps and buzzer indications at bridge and ER for control transfers involving ER.	0.1004	
20B	ER Transfer Flash and Buzzer Gate	Stays low.		Blink signal for ER in control would occur when ER not in control.	ER in control lamp at bridge and ER would flash when ER not in control; could create confusion.	0.1004	
21A	Bridge "Local in Control" Lamp Input Logic	Stays high.		Local in control lamp signal to bridge stays low.	Local in control lamp on bridge would stay lit steady.	0.0669	
21B	Bridge "Local in Control" Lamp Input Logic	Stays low.		Local in control lamp signal to bridge would stay high when it should blink.	Same as #18B.	0.0669	
22A	Local in Control Lamp Gating	Stays high.		Same as #21B; also, lose blink signal to local in control lamp at local panel.	Same as #18B; also, local in control lamp at local panel would not flash.	0.1004	
22B	Local in Control Lamp Gating	Stays low.		Same as #21A and #2B.	Same as #21A and #2B.	0.1004	
23A	Local in Control Lamp Gating	Stays high.		Lose local in control signal to lamps at bridge and ER.	Local in control lamp at bridge and ER would stay dark when local panel had control.	0.0727	
23B	Local in Control Lamp Gating	Stays low.		Local in control signal to lamps at bridge and ER would stay active.	Local in control lamps at bridge and ER would stay lit steady.	0.0727	
24A	Bridge "Local in Control" Lamp Gating	Stays high.		Same as #21A.	Same as #21A.	0.1004	
24B	Bridge "Local in Control" Lamp	Stays low.		Lose local in control lamp signal to bridge when local in control.	Local in control lamp at bridge would stay dark when local panel had control.	0.1004	
25A	ER "Local in Control" Lamp Gating	Stays high.		Same as #7B.	Same as #7B.	0.0669	

FAILURE MODES AND EFFECTS ANALYSIS (PMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS. COMMENTS INDEX
25B	ER "Local in Control" Lamp Gating	Stays low.	Local control lamp at ER will stay dark when it should be flashing.	Lose control transfer in process indication via flashing lamp at ER for transfer involving local station.		0.0669
26A	ER and "Local in Control" Lamp Gating	Stays high.	Same as #25B.	Same as #25B.		0.1004
26B	ER and "Local in Control" Lamp Gating	Stays low.	Same as #8B and #7B.	Same as #8B and #7B.		0.1004
27A	ER "Local in Control" Lamp Gating	Stays high.	Same as #7B.	Same as #7B.		0.1004
27B	ER "Local in Control" Lamp Gating	Stays low.	No effect.	No effect.		0.1004
28A	Local Selected Inverter	Stays high.	Same as #24B.	Same as #24B.		0.0669
28B	Local Selected Inverter	Stays low.	No effect.	No effect.		0.0669
29	Power On Reset Circuit	Any.	Flip flop for Bits 1 and 0 would not reset properly at power turn on; also, initialize signal to other cards would be incorrect.	System state could come up initially in auto mode with associated auto mode circuitry enabled. Also, could come up initially with some undesired station incorrectly selected as the station in control.		2.7280
30A	System in Manual Power Fail Gate	Stays high.	Gate output would continuously indicate that the system was in manual or power had failed; would inhibit bridge control.	Bridge could not take control.		0.1004
30B	System in Manual Power Fail Gate	Stays low.	Gate output would continuously indicate that the system was not in manual and that power had not failed.	Bridge could take control when the system was in manual or when power had failed.		0.1004

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10ES HRS. COMMENTS INDEX
31A	Flash Bridge Input Gate	Stays high.	Flash bridge signal would stay active.	Bridge in control lamp at bridge and ER would flash anytime bridge not in control; transfer buzzer on bridge would also sound.	0.1004	
31B	Flash Bridge Input Gate	Stays low.	Lose flash bridge signal for bridge initiated transfers.	Bridge in control lamp at bridge and ER would not flash and bridge and ER buzzers would not sound for transfers initiated from bridge.	0.1004	
32A	Flash Bridge Gate	Stays high.	Lose bridge transfer buzzer and flash bridge signal.	Bridge in control lamp at bridge and ER would not flash and bridge buzzer would not sound for transfers initiated by bridge or ER.	0.1004	
32B	Flash Bridge Gate	Stays low.	Bridge transfer buzzer and flash bridge signal stays active.	Bridge in control lamp at bridge and ER would continuously flash and bridge buzzer would continuously sound.	0.1004	
33A	Bridge Request Input Gating	Stays high.	ER request for control would always appear active.	ER request for control continuously transmitted to bridge. Nuisance only unless bridge acknowledged request and allowed ER to take control when ER did not want control (e.g., ER unattended).	0.2003	
33B	Bridge Request Input Gating	Stays low.	Lose ER request for control signal.	If ER not in control, control could not be transferred to ER.	0.2003	
34A	Transfer to Bridge Back-Up Gate	Stays high.	Transfer to bridge back-up signal could not switch flip flops to bridge in control positions.	Lose back-up signal for transferring control to bridge.	0.1004	
34B	Transfer to Bridge Back-Up Gate	Stays low.	Transfer to bridge back-up signal would stay active.	Bridge would erroneously be placed in control at the time of failure; attempts to shift control back to ER could result in local station immediately having control. No flashing lamps or buzzing would accompany these erroneous transfers.	0.1004	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS. COMMENTS INDEX
35	U20 Decoder-DeMux	Any.		Depends on nature of failure (interval to IC chip); could cause either or both 1) spontaneous requests for forbidden and non-forbidden transfer requests, 2) loss of 1 or more non-forbidden transfer requests.	Depending on nature of failure, would cause some type of erroneous transfer request or loss of legitimate transfer requests. Except in 1 case, lamps and buzzers would not be effected so there would some warning that something was wrong. The exception is that failure could also cause same effect as #34B.	1.0345
36	Flip Flop's Trigger Gate	Any.		Lose trigger pulse to flip flops; flip flops could not change states.	No control transfers possible.	0.2008
37A	Flip Flop's Trigger Circuit for Back-Up Signal	Output stays high.		Lose flip flop's trigger pulse for back-up transfer to bridge signal; flip flops would not change state.	Same as #34A.	0.2505
37B	Flip Flop's Trigger Circuit for Back-Up Signal	Output stays low.		Same as #36.	Same as #36.	0.2505
38A	Flip Flop's Trigger Circuit for Local Station Transfers	Output stays high.		Lose flip flops' trigger pulse for transfers involving local station.	No transfer possible to local station.	0.4896
38B	Flip Flop's Trigger Circuit for Local Station Transfers	Stays low.		Same as #36.	Same as #36.	0.4896
39A	ER and Bridge Transfer Acknowledge Gate	Stays high.		Lose flip flops' trigger pulse for transfers involving ER and bridge.	No transfer possible to ER or bridge.	0.1004
39B	ER and Bridge Transfer Acknowledge Gate	Stays low.		Same as #36.	Same as #36.	0.1004
40A	ER Transfer Acknowledge Gate	Stays high.		Lose flip flop's trigger pulse for ER transfers.	No transfer possible to ER.	0.1109
40B	ER Transfer Acknowledge Gate	Stays low.		Same as #36.	Same as #36.	0.1109

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
41A	Bridge Transfer Acknowledge Gate	Stays high.	Lose flip flops' trigger pulse for bridge transfers.	No transfer possible to bridge.		0.1109	
41B	Bridge Transfer Acknowledge Gate	Stays low.	Same as #36.	Same as #36.		0.1109	
42A	Transfer to Bridge Inputs to Flip Flops	Output stays high.	Lose flip flop J/K inputs for bridge transfers.	Same as #41A.		0.5131	
42B	Transfer to Bridge Inputs to Flip Flops	Output stays low.	Bridge transfer J/K inputs to flip flops always active; on non-bridge transfers. Flip flop would receive a J and K input simultaneously and not change states.	Same as #10A.		0.5131	
43A	Transfer to Local Inputs to Flip Flops	Output stays high.	Lose flip flop J/K inputs for Local Transfers.	Same as #38A.		0.5471	
43B	Transfer to Local Inputs to Flip Flops	Output stays low.	Same as #42B except for local transfer J/K inputs.	Control not possible from BR or bridge.		0.5471	
44A	U19 BCD to Decimal Decoder and Input	Lose local select outputs.	Same as #43A.	Same as #38A.		0.5168	
44B	U19 BCD to Decimal Decoder and input	Local select outputs stay active.	Same as #43B.	Same as #43B.		0.5168	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1.1 PURGE CONTROL

PAGE 1

REF. NO.	ITEM NOMENCLATURE & FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	S.STEM	FAILURES/ COMMENTS 1025 HRS. INDEX
1	Console Power Supply #1 (redundant to unit #2 below)	Any.	Loss of or incorrect power output from unit.	No effect unless redundant unit failed. If both failed, control system would shut down and vessel would come to a stop.		9.2600
2	Console Power Supply #2 (redundant to unit #1 above)	Any.	Same as #1.	Same as #1.		9.2600

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.2 CONTROL TRANSFER INPUT INTERFACE

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/1000 HRS.	COMMENTS INDEX
1A	Power Fail* LR	Stays high.	Same as 1.1 item #30B.	Same as 1.1 item #30B.		0.4591	
1B	Power Fail* LR	Stays low.	Same as 1.1 item #30A.	Same as 1.1 item #30A.		0.4591	
2A	Power Fail Relay	Sticks open.	Same as 1.1 item #30A.	Same as 1.1 item #30A.		0.8768	
2B	Power Fail Relay	Sticks closed.	Same as 1.1 item #30B.	Same as 1.1 item #30B.		0.8768	
3A	Br ROT in Br Pos LR	Stays high.	Same as 1.1 item #42B.	Same as 1.1 item #10A.		0.4591	
3B	Br ROT in Br Pos LR	Stays low.	Same as 1.1 item #42A.	Same as 1.1 item #41A.		0.4591	
4A	ER ROT in Br Pos LR	Stays high.	Same as 1.1 item #42B.	Same as 1.1 item #10A.		0.4591	
4B	ER ROT in Br Pos LR	Stays low.	Same as 1.1 item #42A.	Same as 1.1 item #41A.		0.4591	
5A	Br Xfer Ack PB* LR	Stays high.	Same as 1.1 item #41A.	Same as 1.1 item #41A.		0.4591	
5B	Br Xfer Ack PB* LR	Stays low.	Same as 1.1 item #36.	Same as 1.1 item #36.		0.4591	
6	Br Xfer Ack PB	Fails open.	Same as 1.1 item #41A.	Same as 1.1 item #41A.		0.4600	
7A	Local Selected LR	Stays high.	Same as 1.1 item #36.	Same as 1.1 item #36.		0.4591	
7B	Local Selected LR	Stays low.	Same as 1.1 item #38A.	Same as 1.1 item #38A.		0.4591	
8	Local Selected Switch	Fails open.	Same as 1.1 item #36.	Same as 1.1 item #36.		7.0000	
9A	ER Xfer Ack PB* LR	Stays high.	Same as 1.1 item #40A.	Same as 1.1 item #40A.		0.4591	
9B	ER Xfer Ack PB* LR	Stays low.	Same as 1.1 item #36.	Same as 1.1 item #36.		0.4591	
10	ER Xfer Ack PB	Fails open.	Same as 1.1 item #40A.	Same as 1.1 item #40A.		0.4600	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.1 CONTROL TRANSFER OUTPUT INTERFACE

PAGE: 1

R/P. NO	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURE/ COMMENTS 1986 EKS. INDEX
1A	Bridge Bell/Alarm Relay Drv	Stays on.	Same as 1.1 item #28.	Same as 1.1 item #28.		0.5822
1B	Bridge Bell/Alarm Relay Drv	Stays off.	Same as 1.1 item #2A.	Same as 1.1 item #2A.		0.5822
2A	ER Bell/Buzz Relay Drv	Stays on.	Same as 1.1 item #3B.	Same as 1.1 item #3B.		1.1644
2B	ER Bell/Buzz Relay Drv	Stays off.	Same as 1.1 item #3A.	Same as 1.1 item #3A.		1.1644
3A	Br in Cntl Lamp Drv	Stays on.	Same as 1.1 item #4B.	Same as 1.1 item #4B.		0.5822
3B	Br in Cntl Lamp Drv	Stays off.	Same as 1.1 item #4A.	Same as 1.1 item #4A.		0.5822
4A	ER in Cntl Lamp Relay Drv	Stays on.	Same as 1.1 item #5B.	Same as 1.1 item #5B.		0.5822
4B	ER in Cntl Lamp Relay Drv	Stays off.	Same as 1.1 item #5A.	Same as 1.1 item #5A.		0.5822
5A	Local Cntl Lamp (Br) Relay Drv	Stays on.	Same as 1.1 #6B.	Same as 1.1 #6B.		0.5822
5B	Local Cntl Lamp (Br) Relay Drv	Stays off.	Same as 1.1 #6A.	Same as 1.1 #6A.		0.5822
6A	Local Cntl Lamp (ER) Relay Drv	Stays on.	Same as 1.1 #7B.	Same as 1.1 #7B.		0.5822
6B	Local Cntl Lamp (ER) Relay Drv	Stays off.	Same as 1.1 #7A.	Same as 1.1 #7A.		0.5822
7A	Local Cntl Lamp (LCL) Relay Drv	Stays on.	Same as 1.1 #8B.	Same as 1.1 #8B.		0.5822
7B	Local Cntl Lamp (LCL) Relay Drv	Stays off.	Same as 1.1 #8A.	Same as 1.1 #8A.		0.5822
8A	Br Xfer Ack PB Relay Drv	Stays on.	Same as 1.1 #9B.	Same as 1.1 #9B.		0.5822
8B	Br Xfer Ack PB Relay Drv	Stays off.	Same as 1.1 #9A.	Same as 1.1 #9A.		0.5822

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 2.1 ENGINE AND CLUTCH CONTROL LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS.	COMMENTS INDEX
1A	Power Filtering	Capacitors open.	Lose some EMI filtering.	No effect		0.3797	
1B	Power Filtering	Capacitors short.	5 volt power to system shorted to ground.	Same as FMEA 1.1 item #1B.		0.641:	
2A	Engine Start Permissive Gate	Stays high.	Signal to engine start solenoid valve never active.	Engine could not be started.		0.4017	
2B	Engine Start Permissive Gate	Stays low.	Start signal could be enabled when start permissives not met.	Engine could be started when permissives not met (e.g., lo pres not normal, barring gear engaged, etc.).		0.4017	
3A	Start Permissives NOR Gate	Stays high.	Same as #2A.	Same as #2B.		0.1052	
3B	Start Permissives NOR Gate	Stays low.	Same as #2A.	Same as #2A.		0.1052	
4A	Engine Start Solenoid Valve Output	Output stays low.	Signal to engine start solenoid valve always active.	Erroneous engine start continuously attempted; interlocks are provided on the engine to prevent an erroneous start if the engine is already running.		0.1766	
4B	Engine Start Solenoid Valve Output	Output stays high.	Same as #2A.	Same as #2A.		0.1766	
5A	Engine Barring Gear Engaged Input	Stays high.	Engine Barring Gear Engaged Annunciator signal would occur whenever engine start PB depressed.	Engine barring gear engaged annunciator would occur at all starts; crew would probably abort start attempt.		0.0714	
5B	Engine Barring Gear Engaged Input	Stays low.	Engine Barring Gear Engaged Annunciator signal never active.	Lose engine barring gear engaged annunciator.		0.0714	
6A	Engine Barring Gear Engaged Output	Stays high.	Signal to engine barring gear engaged annunciator always active.	False engine barring gear engaged annunciator.		0.1052	
6B	Engine Barring Gear Engaged Output	Stays low.	Same as #5B.	Same as #5B.		0.1052	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS. INDEX	COMMENTS
7A	Shutdown Reset Latch	Stays set.		Shutdown reset output stays high; loss shutdown reset signal to engine start permissive gate.	Engine could not be restarted following an auto shutdown.	0.3365	
7B	Shutdown Reset Latch	Stays reset.		Shutdown reset output stays low; engine start permissives gates would stay high--same as 7A.	Same as #2A.	0.3365	
8A	Emergency Stop Latch	Stays set.		Emergency stop PB function always appears active; engine start would stay inhibited and emergency stop solenoid valve signal would stay active.	Engine would shutdown and could not be started.	0.4079	
8B	Emergency Stop Latch	Stays reset.		Emergency stop PB signal never active.	Loss emergency stop capability.	0.4079	
9A	Remote Stop Solenoid Valve Latch	Stays set.		Signal to remote stop solenoid valve would stay active (high); solenoid would stay energized.	Engine would stop.	0.2883	
9B	Remote Stop Solenoid Valve Latch	Stays reset.		Signal to remote stop solenoid valve never active; solenoid valve never energized.	Engine could not be stopped via stop PB.	0.2883	
10A	Engine Shutdown Gate	Stays high.		Energize emergency stop solenoid valve signal would stay active whenever shutdown override not in effect.	Engine would stop whenever shutdown override not in effect.	0.4017	
10B	Engine Shutdown Gate	Stays low.		Shutdown signal would not go active if shutdown condition occurred.	Engine would not shutdown if shutdown condition occurred (e.g., JW pressure not normal, Inj coolant temp not normal, etc.).	0.4017	
11A	Shutdown Override Gate	Stays high.		Same as #10B.	Same as #10B.	0.1052	
11B	Shutdown Override Gate	Stays low.		Energize Emergency Stop Solenoid Valve signal would stay active.	Same as #9A.	0.1052	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
12A	Energize Emergency Stop Solenoid Valve Output Gate	Stays high.	Same as #11B.	Same as #9A.		0.1052	
12B	Energize Emergency Stop Solenoid Valve Output Gate	Stays low.	Same as #10B and #8B.	Engine would not shutdown if shutdown condition occurred (same as #10B) or if emergency stop PB depressed (same as #8B).		0.1052	
13A	Emergency Stop Inverter	Stays high.	Emergency stop signal never resets clutch engage latch.	Clutch would remain engaged following an emergency stop.		0.0714	
13B	Emergency Stop Inverter	Stays low.	Emergency stop signal to clutch engage latch reset stays active; clutch engage latch stays reset.	Clutch would disengage.		0.0714	
14A	Clutch Engage Latch Reset Circuit	Output stays high.	Clutch Engage Latch Reset signal never active; clutch engage latch stays set.	Clutch would stay engaged.		0.2122	2
14B	Clutch Engage Latch Reset Circuit	Output stays low.	Clutch engage latch reset signal always active; clutch engage latch stays reset.	Same as #13B.		0.2122	
15A	Clutch Engage Latch	Stays set.	Clutch engage latch cannot be reset.	Same as #14A.		0.4717	
15B	Clutch Engage Latch	Stays reset.	Clutch engage latch cannot be set.	Same as #13B.		0.4717	
16A	Br Clutch Disengage Cmd Input	Stays high.	Clutch disengage command from bridge always active; clutch engage latch would stay reset.	Same as #13B.		0.1004	
16B	Br Clutch Disengage Cmd Input	Stays low.	Clutch disengage command from bridge never active; clutch engage latch would stay set when bridge in control.	Bridge could not disengage clutch.		0.1004	
17A	BR Clutch Disengage Cmd Input	Stays high.	Clutch disengage command from BR always active; clutch engage latch would stay reset.	Same as #13B.		0.1004	

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
17B	ER Clutch Disengage Cmd Input	Stays low.		Clutch disengage command from ER never active; clutch engage latch would stay set when ER in control.	ER could not disengage clutch.	0.1004	
18A	Clutch Disengage Command Gate	Stays high.		Clutch disengage commands from bridge and ER never active; clutch engage latch would stay set.	Clutch could not be disengaged by bridge nor ER.	0.1004	
18B	Clutch Disengage Command Gate	Stays low.		Same as #14B.	Same as #11B.	0.1004	
19A	ER Clutch Engage Command Input	Stays high.		Clutch engage command from ER always active; clutch engage latch would stay set whenever clutch engage permissives met.	Clutch would stay engaged whenever clutch engage permissives met (prop pitch flat, thrust control at zero, etc.).	0.1004	
19B	ER Clutch Engage Command Input	Stays low.		Clutch engage command from ER never active.	ER could not engage clutch.	0.1004	
20A	Bridge Clutch Engage Command Input	Stays high.		Clutch engage command from bridge always active; clutch engage latch would stay set whenever clutch engage permissives met.	Same as #19A.	0.1004	
20B	Bridge Clutch Engage Command Input	Stays low.		Clutch engage command from bridge never active.	Bridge could not engage clutch.	0.1004	
21A	Clutch Engage Command Gate	Stays high.		Clutch engage commands from bridge and ER never active.	Clutch could not be engaged by bridge nor ER.	0.1004	
21B	Clutch Engage Command Gate	Stays low.		Clutch engage command always active; clutch engage latch would stay set whenever clutch engage permissives met.	Same as #19A.	0.1004	
22A	Reduction Gear L.O. Pressure Adq* Input	Stays high.		Reduction gear L.O. pressure always appears adequate.	Engine would not shutdown if reduction gear L.O. pressure not adequate.	0.0714	

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1006 HRS.	COMMENTS INDEX
22B	Reduction Gear L.O. Pressure Ack* Input	Stays low.	Reduction gear L.O. pressure never looks adequate.	Same as #9A.		0.0714	
23A	Reduction Gear Barring Gear Engaged Output	Stays high.	Signal to reduction gear barring gear engaged annunciator stays active.	False reduction gear barring gear engaged annunciator.		0.1052	
23B	Reduction Gear Barring Gear Engaged Output	Stays low.	Lose signal to reduction gear barring gear engaged annunciator.	Lose reduction gear barring gear engaged annunciator.		0.1052	
24A	Clutch Engaged Permissives Gate	Stays high.	Clutch engage permissives never appears met.	Same as #21A.		0.2051	
24B	Clutch Engaged Permissives Gate	Stays low.	Clutch engage permissives always appears met.	Clutch could be engaged when permissives not met (e.g., CRP hyd pressure not adequate, engine speed less than M1 speed, etc.).		0.2051	
25A	Clutch Engaged Permissives/Command Gate	Stays high.	Same as #21B.	Same as #19A.		0.1052	
25B	Clutch Engaged Permissives/Command Gate	Stays low.	Same as #21A.	Same as #21A.		0.1052	
26A	Other Clutch Engaged* Input	Stays high.	Other clutch always appears engaged.	Clutch could be engaged when other engine running but the two engines not synchronized.		0.0714	
26B	Other Clutch Engaged* Input	Stays low.	Other clutch never appears engaged.	Clutch could not be engaged when other engine running.		0.0714	
27A	Clutch Engaged/Command Gate	Stays high.	Lose clutch engage command for situation where other clutch already engaged.	Same as #26B.		0.1026	
27B	Clutch Engaged/Command Gate	Stays low.	Clutch engage command always active for situation where other clutch already engaged.	Clutch would erroneously engage whenever the speed of the two engines matched.		0.1026	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1086 HRS.	COMMENTS INDEX
28A	Clutch Engaged Command Check Circuit	Output stays high.	Clutch engage command always active.	Same as #14A.		0.2765	
28B	Clutch Engaged Command Check Circuit	Output stays low.	Loss clutch engage command for situation where other clutch is not already engaged.	Clutch could not be engaged unless other clutch already engaged.		0.2765	
29A	Speed Match Circuit	Stays high.	Same as #28A.	Same as #14A.		0.1052	
29B	Speed Match Circuit	Stays low.	Same as #27A.	Same as #26B.		0.1052	
30A	Clutch Engaged Latch Set Circuit	Output stays high.	Clutch engage command always active.	Same as #14A.		0.1766	
30B	Clutch Engaged Latch Set Circuit	Output stays low.	Same as #21A.	Same as #13B.		0.1766	
31A	Clutch Engaged Inverter	Stays high.	Loss start inhibit if clutch is engaged.	Engine could be started with clutch engaged.		0.0714	
31B	Clutch Engaged Inverter	Stays low.	Clutch engaged start inhibit always active.	Same as #2A.		0.0714	
32A	Energize E/P Relay* Output	Stays high.	Loss Energize E/P Relay signal.	Engine could not be operated in auto mode. Also, E/P would "see" idle signal and take the engine off-line.		0.1052	
32B	Energize E/P Relay* Output	Stays low.	Energize E/P Relay signal always active.	Split mode operation not possible.		0.1052	
33A	Energize Clutch Fill Solenoid* Output	Stays high.	Loss signal to energize clutch fill solenoid.	Same as #13B.		0.1052	
33B	Energize Clutch Fill Solenoid* Output	Stays low.	Clutch Fill Solenoid Energized signal always active.	Same as #14A.		0.1052	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
1	Engine Tach-Gen	Lose output.	Lose Engine Speed signal.	Lose auto engine control.		19.6800	
2	Engine RPM Indication	Meter fails.	Engine RPM indicator reading wrong.	Lose manual-visual engine RPM indication.		10	
3A	Engine Stop Annunciator Setpoint Channel	Stays on.	Engine stop annunciator signal stays active.	False engine stop annunciator.		3.1692	
3B	Engine Stop Annunciator Setpoint Channel	Stay off.	Engine Stop Annunciator signal never active.	Lose engine stop annunciator.		3.1692	
4A	Engine Stop Annunciator Relay Driver Channel	Stays on.	Same as #3A.	Same as #3A.		0.5822	
4B	Engine Stop Annunciator Relay Driver Channel	Stays off.	Same as #3B.	Same as #3B.		0.5822	
5A	Engine Start Annunciator Setpoint Channel	Stays on.	Engine Start Annunciator signal stays active.	False engine start annunciator.		3.1692	
5B	Engine Start Annunciator Setpoint Channel	Stays off.	Engine Start Annunciator signal never active.	Lose engine start annunciator.		3.1692	
6A	Engine Start Annunciator Relay Driver Channel	Stays on.	Same as #5A.	Same as #5A.		0.5822	
6B	Engine Start Annunciator Relay Driver Channel	Stays off.	Same as #5B.	Same as #5B.		0.5822	
7A	Engine Speed Greater than Start Signal	Stays high.	Same as 2.1 item #2A.	Same as 2.1 item #2A.		3.1692	
7B	Engine Speed Greater than Start Signal	Stays low.	Same as 2.1. item #4A.	Same as 2.1 item #4A.		3.1692	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/1006 HRS.	COMMENTS INDEX
8A	M1 Speed Signal	Stays high.	Engine speed always appears greater than or equal M1 speed.	Clutch could be engaged without regard to engine speed.		3.1692	
8B	M1 Speed Signal	Stays low.	Same as 2.1 item #24A.	Same as 2.1 item #21A.		3.1692	
9	F.O. Pressure Sensor	Lose output.	Lose F.O. Pressure signal.	Same as 2.1 item #10A.		8.6600	
10	F.O. Pressure Signal Conditioner	Lose output.	Same as #9.	Same as 2.1 item #10A.		7.6176	
11	Fuel Oil Pressure Gauge	Meter fails.	Fuel oil pressure gauge reading wrong.	Lose manual-visual F.O. pressure indication.		10	
12A	F.O. Pressure Setpoint Channel	Stays on.	F.O. pressure always appears normal.	Lose engine start inhibit if F.O. pressure not normal.		3.1692	
12B	F.O. Pressure Setpoint Channel	Stays off.	Same as #9.	Same as 2.1 item #10A.		3.1692	
13A	F.O. Pressure Alarm Channel	Stays on.	Same as #12A.	Same as #12A.		1.3012	
13B	F.O. Pressure Alarm Channel	Stays off.	Same as #9.	Same as 2.1 item #10A.		1.3012	
13C	F.O. Pressure Alarm Channel	Alarm signal stays on.	F.O. Pressure Annunciator signal always active.	False F.O. pressure annunciator.		0.8675	
13D	F.O. Pressure Alarm Channel	Alarm signal stays off.	F.O. Pressure Annunciator signal never active.	Lose F.O. pressure annunciator.		0.8675	
14A	F.O. Pressure Line Receiver Channel	Stays high.	Same as #12A.	Same as #12A.		0.3292	
14B	F.O. Pressure Line Receiver Channel	Stays low.	Same as #9.	Same as 2.1 item #10A.		0.3292	
15	Engine L.O. Pressure Sensor	Lose output.	Lose Engine L.O. Pressure Signal.	Same as 2.1 item #10A.		8.6600	
16	Engine L.O. Pressure Signal Conditioner	Lose output.	Same as #15.	Same as 2.1 item #10A.		7.6176	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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REP. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS. COMMENTS INDEX
17	Engine L.O. Pressure Gauge	Meter fails.	Engine L.O. pressure gauge reading wrong.	Lose manual-visual engine L.O. pressure indication.		10
18A	Engine L.O. Pressure Setpoint Channel	Stays on.	Engine L.O. pressure always normal.	Lose engine start inhibit if L.O. pressure not normal.		1.1692
18B	Engine L.O. Pressure Setpoint Channel	Stays off.	Same as #15.	Same as 2.1 item #10A.		1.1692
19A	Engine L.O. Pressure Alarm Channel	Stays on.	Same as #18A.	Same as #18A.		1.3012
19B	Engine L.O. Pressure Alarm Channel	Stays off.	Same as #15.	Same as 2.1 item #10A.		1.3012
19C	Engine L.O. Pressure Alarm Channel	Alarm signal stays on.	Engine L.O. Pressure Annunciator signal always active.	False engine L.O. pressure annunciator.		0.8675
19D	Engine L.O. Pressure Alarm Channel	Alarm signal stays off.	Engine L.O. Pressure Annunciator signal never active.	Lose engine L.O. pressure annunciator.		0.8675
20A	Engine L.O. Pressure LR Channel	Stays high.	Same as #18A.	Same as #18A.		0.3292
20B	Engine L.O. Pressure LR Channel	Stays low.	Same as #15.	Same as 2.1 item #10A.		0.3292
21	Rocker L.O. Pressure Switch	Lose output.	Lose Rocker L.O. Pressure signal.	Same as 2.1 item #10A.		2.9000
22A	Rocker L.O. Pressure Alarm Channel	Stays on.	Rocker L.O. pressure always appears normal.	Lose engine start inhibit if rocker L.O. pressure not normal.		1.3012
22B	Rocker L.O. Pressure Alarm Channel	Stays off.	Same as #21.	Same as 2.1 item #10A.		1.3012
22C	Rocker L.O. Pressure Alarm Channel	Alarm signal stays on.	Rocker L.O. Pressure Annunciator signal stays active.	False rocker L.O. pressure annunciator.		0.8675

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/10E6 HRS.	COMMENTS INDEX
22D	Rocker L.O. Pressure Alarm Channel	Alarm signal stays off.	Rocker L.O. Pressure Annunciator	signal never active.	Lose rocker L.O. pressure annunciator.	0.8675	
23A	Rocker L.O. Pressure L.R.	Stays high.	Same as #22A.	Same as #22A		0.3292	
23B	Rocker L.O. Pressure L.R.	Stays low.	Same as #21.	Same as 2.1 item #10A.		0.3292	
24	J.W. Pressure Sensor	Lose output.	Lose J.W. Pressure signal.	Same as 2.1 item #10A.		8.6600	
25A	J.W. Pressure Alarm Channel	Stays on.	J.W. pressure always appears normal.	Lose engine start inhibit if J.W. pressure not normal.		1.3012	
25B	J.W. Pressure Alarm Channel	Stays off.	Same as #24.	Same as 2.1 item #10A.		1.3012	
25C	J.W. Pressure Alarm Channel	Alarm signal stays on.	J.W. Pressure Annunciator signal stays active.	False J.W. pressure annunciator.		0.8675	
25D	J.W. Pressure Alarm Channel	Alarm signal stays off.	J.W. Pressure Annunciator never active.	Lose J.W. pressure annunciator.		0.8675	
26A	J.W. Pressure L.R.	Stays high.	Same as #25A.	Same as #25A.		0.3292	
26B	J.W. Pressure L.R.	Stays low.	Same as #24.	Same as 2.1 item #10A.		0.3292	
27	J.W. Temperature Sensor	Lose output.	Lose J.W. Temperature signal.	Same as 2.1 item #10A.		75.98	
28	J.W. Temperature Signal Conditioner	Lose output.	Same as #27.	Same as 2.1 item #10A.		7.6176	
29	J.W. Temperature Gauge	Meter fails.	J.W. temperature gauge reading wrong.	Lose manual visual J.W. temperature indication.		10	
30A	J.W. Temperature Setpoint Channel	Stays on.	J.W. temperature always appears normal.	Lose engine start inhibit if J.W. temperature not normal.		3.1692	
30B	J.W. Temperature Setpoint Channel	Stays off.	Same as #27.	Same as 2.1 item #10A.		3.1692	
31A	J.W. Temperature Alarm Channel	Stays on.	Same as #30A.	Same as #30A.		1.3012	

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
31B	J.W. Temperature Alarm Channel	Stays off.	Same as #27.	Same as 2.1 item #10A.		1.3012	
31C	J.W. Temperature Alarm Channel	Alarm signal stays on.	J.W. Temperature Annunciator signal always active.	False J.W. temperature annunciator.		0.8675	
31D	J.W. Temperature Alarm Channel	Alarm signal stays off.	J.W. Temperature Annunciator signal never active.	Lose J.W. temperature annunciator.		0.8675	
32A	J.W. Temperature L.R.	Stays high.	Same as #30A.	Same as #30A.		0.3292	
32B	J.W. Temperature L.R.	Stays low.	Same as #27.	Same as 2.1 item #10A.		0.3292	
33	Inj. Coolant Pressure Sensor	Lose output.	Lose Inj. Coolant Pressure signal.	Same as 2.1 item #10A.		2.9000	
34A	Inj. Coolant Pressure Alarm Channel	Stays on.	Inj. coolant pressure always appears normal.	Lose engine start inhibit if inj. coolant pressure not normal.		1.3012	
34B	Inj. Coolant Pressure Alarm Channel	Stays off.	Same as #33.	Same as 2.1 item #10A.		1.3012	
34C	Inj. Coolant Pressure Alarm	Alarm signal stays on.	Inj. Coolant Pressure Annunciator signal always active.	False inj. coolant pressure annunciator.		0.8675	
34D	Inj. Coolant Pressure Alarm	Alarm signal stays off.	Inj. Coolant Pressure Annunciator signal never active.	Lose inj. coolant pressure annunciator.		0.8675	
35A	Inj. Coolant Pressure L.R.	Stays high.	Same as #34A.	Same as #34A.		0.3292	
35B	Inj. Coolant Pressure L.R.	Stays low.	Same as #33.	Same as 2.1 item #10A.		0.3292	
36	Inj. Coolant Temperature Sensor	Lose output.	Lose Inj. Coolant Temperature signal.	Same as #39A below.		75.98	
37	Inj. Coolant Temperature Signal Conditioning	Lose output.	Same as #36.	Same as #39A below.		7.6176	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 2.2 ENGINE AND CLUTCH CONTROL INPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ COMMENTS 1005 HRS. INDEX
38	Inj. Coolant Temperature Gauge	Meter fails.	Inj. coolant temperature gauge reading wrong.	Loss manual-visual inj. coolant temperature indicator.	10	
39A	Inj. Coolant Temperature Setpoint Channel	Stays on.	Inj. coolant temperature always appears normal	Loss engine start inhibit if inj. coolant temperature not normal.	3.1692	
39B	Inj. Coolant Temperature Setpoint Channel	Stays off.	Same as #36.	Same as 2.1 item #10A.	3.1692	
40A	Inj. Coolant Temperature Alarm Channel	Stays on.	Same as #39A.	Same as #39A.	1.3012	
40B	Inj. Coolant Temperature Alarm Channel	Stays off.	Same as #36.	Same as 2.1 item #10A.	1.3012	
40C	Inj. Coolant Temperature Alarm Channel	Alarm signal stays on.	Inj. Coolant Temperature Annunciator signal stays active.	False inj. coolant temperature annunciator.	0.8675	
40D	Inj. Coolant Temperature Alarm Channel	Alarm signal stays off.	Inj. Coolant Temperature Annunciator signal never active.	Loss inj. coolant temperature annunciator.	0.8675	
41A	Inj. Coolant Temperature L.R.	Stays high.	Same as #39A.	Same as #39A.	0.3292	
41B	Inj. Coolant Temperature L.R.	Stays low.	Same as #36.	Same as 2.1 item #10A.	0.3292	
42	Reduction Gear L.O. Pressure Sensor	Loss output.	Loss Reduction Gear L.O. Pressure signal.	Same as 2.1 item #10A.	4.9000	
43A	Reduction Gear L.O. Pressure Alarm Channel	Stays on.	Reduction gear L.O. pressure always appears normal.	Loss engine start inhibit if reduction gear L.O. pressure not normal.	1.3012	
43B	Reduction Gear L.O. Pressure Alarm Channel	Stays off.	Same as #42.	Same as 2.1 item #10A.	1.3012	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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SUBSYSTEM: 2.2 ENGINE AND CLUTCH CONTROL INPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 MRS. COMMENTS INDEX
43C	Reduction Gear L.O. Pressure Alarm Channel	Alarm signal stays on.	Reduction gear L.O. pressure annunciator signal always active.	False reduction gear L.O. pressure annunciator.		0.8675
43D	Reduction Gear L.O. Pressure Alarm Channel	Alarm signal stays off.	Reduction gear L.O. pressure annunciator never active.	Lose reduction gear L.O. annunciator.		0.8675
44A	Reduction Gear L.O. Pressure L.R.	Stays high.	Same as #42.	Same as 2.1 item #10A.		0.3292
44B	Reduction Gear L.O. Pressure L.R.	Stays low.	Same as #43A.	Same as #43A.		0.3292
45	Shutdown Override PS	Fails open.	Shutdown override signal never active.	Lose capability for manually overriding an auto engine shutdown.		0.4600
46A	Shutdown Override L.R.	Stays high.	Same as #45.	Same as #45.		0.3292
46B	Shutdown Override L.R.	Stays low.	Shutdown override signal always active.	No effect--normal operation.		0.3292
47	Propeller Hydraulic Pressure Signal Pressure Sensor	Fails open.	Propeller hydraulic pressure always appears adequate.	Lose inhibit against engaging clutch if propeller hydraulic pressure not adequate.		0.6603
48A	Propeller Hydraulic Pressure Signal Pressure Sensor	Stays on.	Propeller hydraulic pressure never appears adequate.	Same as 2.1 item #21A.		1.3012
48B	Propeller Hydraulic Pressure Signal Pressure Sensor	Stays off.	Same as #47.	Same as #47.		1.3012
48C	Propeller Hydraulic Pressure Signal Pressure	Alarm signal stays on.	Propeller hydraulic pressure not adequate annunciator signal stays active.	False propeller hydraulic pressure not adequate annunciator.		0.8675

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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SUBSYSTEM: 2.2 ENGINE AND CLUTCH CONTROL INPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10 ⁶ HRS.	COMMENTS INDEX
48D	Propeller Hydraulic Pressure Signal Pressure	Alarm signal stays off.	Propeller hydraulic pressure	Propeller hydraulic pressure not adequate annunciator signal never active.	Loss propeller hydraulic pressure not adequate annunciator.	0.8675	
49	Shutdown Reset PB	Fails open.	Shutdown reset latch would stay reset following on engine shutdown.	Same as 2.1 item #7A.		0.4600	
50A	Shutdown Reset L.R.	Stays high.	Loss shutdown reset PB function.	Same as 2.1 item #7A.		0.3292	
50B	Shutdown Reset L.R.	Stays low.	Shutdown reset P.B. always appears depressed.	Loss inhibit against starting engine if shutdown condition exists.		0.3292	
51	Emergency Stop P.B.	Fails open.	Loss emergency stop P.B. switch function.	Engine could not be stopped via emergency stop P.B. switch.		0.4600	
52A	Emergency Stop P.B. L.R.	Stays high.	Same as #51.	Same as #51.		0.3292	
52B	Emergency Stop P.B. L.R.	Stays high.	Emergency stop P.B. always appears depressed.	Same as 2.1 item #8A.		0.3292	
53	Engine Brg. Gear Engaged Sensor	Fails open.	Engine brg. gear appears engaged.	Same as 2.1 item #2A.		2.9000	
54A	Engine Brg. Gear Engaged L.R.	Stays high.	Engine brg. gear never appears engaged.	Loss inhibit against starting engine when engine brg. gear engaged.		0.3292	
54B	Engine Brg. Gear Engaged L.R.	Stays low.	Same as #53.	Same as 2.1 item #2A.		0.3292	
55	Engine Overspeed Sensor	Fails open.	Overspeed condition appears to exist.	Same as 2.1 item #9A.		2.9000	
56A	Engine Overspeed L.R.	Stays high.	Engine overspeed signal never active.	Loss engine shutdown on overspeed.		0.3292	
56B	Engine Overspeed L.R.	Stays low.	Same as #55.	Same as 2.1 item #9A.		0.3292	
57A	Engine Overspeed Alarm Channel	Alarm signal stays on.	Engine Overspeed Annunciator signal stays active.	False engine overspeed annunciator.		4.3374	
57B	Engine Overspeed Alarm Channel	Alarm signal stays off.	Engine Overspeed Annunciator signal never active.	Loss engine overspeed annunciator.		4.3374	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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SUBSYSTEM: 2.2 ENGINE AND CLUTCH CONTROL INPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1006 HRS.	COMMENTS INDEX
58	Reduction Gear Barring Gear Engaged Sensor	Fails open.	Reduction gear barring gear	appears engaged.	Same as 2.1 item #21A.	2.9000	
59A	Reduction Gear Barring Gear L.R.	Stays high.	Reduction gear barring gear	never appears engaged.	Loose inhibit against engaging clutch if reduction gear barring gear is engaged.	0.3292	
59B	Reduction Gear Barring Gear L.R.	Stays low.	Same as #58.		Same as 2.1 item #21A.	0.3292	
60	Clutch Engaged Sensor	Fails open.	Clutch always appear engaged.		Engine could not be started; also loose inhibit against energizing E/P relay if clutch is not engaged.	2.9000	
61A	Clutch Engaged L.R.	Stays high.	Same as #60.		Same as #60.	0.3292	
61B	Clutch Engaged L.R.	Stays low.	Clutch never appears engaged.		Same as 2.1 item #31A.	0.3292	
62	Engine Start P.B.	Fails open.	Engine start P.B. never appears depressed.		Same as 2.1 item #2A.	0.4600	
63A	Engine Start P.B. L.R.	Stays high.	Engine start P.B. always appears depressed.		Engine would start erroneously whenever start permissives met (e.g., L.O. pressure normal, clutch not engaged, et	0.3292	
63B	Engine Start P.B. L.R.	Stays low.	Same as #62.		Same as 2.1 item #2A.	0.3252	
64	Engine Stop P.B.	Fails open.	Engine stop P.B. always appears depressed.		Same as 2.1 item #9A.	0.4600	
65A	Engine Stop P.B. L.R.	Stays high.	Engine stop P.B. never appears depressed.		Same as 2.1 item #9A.	0.3292	
65B	Engine Stop P.B. L.R.	Stays low.	Same as #64.		Same as 2.1 item #9A.	0.3292	
66	ER Clutch Disengage PB	Fails open.	ER clutch disengage PB never appears depressed.		Same as 2.1 item #17B.	0.4600	
67A	ER Clutch Disengage PB L.R.	Stays high.	ER clutch disengage PB always appears depressed.		Clutch would disengage whenever ER in control.	0.3292	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 2.2 ENGINE AND CLUTCH CONTROL INPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
67B	ER Clutch Disengage PB L.R.	Stays low.	Same as #66.	Same as 2.1 item #17B.		0.3292	
68	Bridge Clutch Disengage PB	Fails open.	Bridge clutch disengage PB never appears depressed.	Same as 2.1 item #16B.		0.4600	
69A	Bridge Clutch Disengage PB L.R.	Stays high.	Bridge clutch disengage PB always appears depressed.	Clutch would disengage whenever bridge in control.		0.3292	
69B	Bridge Clutch Disengage PB L.R.	Stays low.	Same as #68.	Same as 2.1 item #16B.		0.3292	
70	ER Clutch Engage PB	Fails open.	ER clutch engage PB never appears depressed.	Same as 2.1 item #19B.		0.4600	
71A	ER Clutch Engage PB LR	Stays high.	ER clutch engage PB always appears depressed.	Clutch would engage whenever ER in control.		0.3292	
71B	ER Clutch Engage PB LR	Stays low.	Same as #70.	Same as 2.1 item #19B.		0.3292	
72	Bridge Clutch Engage PB	Fails open.	Bridge clutch engage PB never appears depressed.	Same as 2.1 item #20B.		0.4600	
73A	Bridge Clutch Engage PB L.R.	Stays high.	Bridge clutch engage PB always appears depressed.	Clutch would engage whenever bridge in control.		0.3292	
73B	Bridge Clutch Engage PB L.R.	Stays low.	Same as #72.	Same as 2.1 item #20B.		0.3292	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 2.3 ENGINE AND CLUTCH CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
1A	Engine Start Relay Driver	Stays on.	Same as 2.1 item #4A.	Same as 2.1 item #4A.		0.4400	
1B	Engine Start Relay Driver	Stays off.	Same as 2.1 item #2A.	Same as 2.1 item #2A.		0.4400	
2A	Engine Start Relay	Contact Sticks open.	Same as 2.1 item #4A.	Same as 2.1 item #4A.		0.5300	
2B	Engine Start Relay	Contact Sticks closed.	Same as 2.1 item #2A.	Same as 2.1 item #2A.		0.5300	
3A	Engine Start Solenoid	Fails open.	Same as 2.1 item #4A.	Same as 2.1 item #4A.		19.2050	
3B	Engine Start Solenoid	Fails closed.	Same as 2.1 item #2A.	Same as 2.1 item #2A.		19.2050	
4A	Engine Stop Relay Driver	Stays on.	Same as 2.1 item #9A.	Same as 2.1 item #9A.		0.4400	
4B	Engine Stop Relay Driver	Stays off.	Same as 2.1 item #9B.	Same as 2.1 item #9B.		0.4400	
5A	Engine Stop Relay	Contact Sticks open.	Same as 2.1 item #9B.	Same as 2.1 item #9B.		0.5300	
5B	Engine Stop Relay	Contact Sticks closed.	Same as 2.1 item #9A.	Same as 2.1 item #9A.		0.5300	
6A	Engine Stop Solenoid	Fails open.	Same as 2.1 item #9A.	Same as 2.1 item #9A.		19.2050	
6B	Engine Stop Solenoid	Fails closed.	Same as 2.1 item #9B.	Same as 2.1 item #9B.		19.2050	
7A	Emergency Stop Relay Driver	Stays on.	Same as 2.1 item #11B.	Same as 2.1 item #9A.		0.4400	
7B	Emergency Stop Relay Driver	Stays off.	Same as 2.1 items #8B and #10B.	Same as 2.1 item #12B.		0.4400	
8A	Emergency Stop Relay	Contact Sticks open.	Same as 2.1 items #8B and #10B.	Same as 2.1 item #12B.		0.5300	
8B	Emergency Stop Relay	Contact Sticks closed.	Same as 2.1 item #11B.	Same as 2.1 item #9A.		0.5300	
		Engine shutdown alarm signal		False engine shutdown alarm.		1.6535	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 2.3 ENGINE AND CLUTCH CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1086 HRS.	COMMENTS INDEX
9B	Engine Shutdown Alarm	Stays off.	Engine shutdown alarm signal never active.	Loss engine shutdown alarm.		1.6535	
10A	Clutch Relay Driver	Stays on.	Same as 2.1 item #33B.	Same as 2.1 item #14A.		1.6535	
10B	Clutch Relay Driver	Stays off.	Same as 2.1 item #33A.	Same as 2.1 item #13B.		1.6535	
11A	Clutch Relay	Contact Sticks open.	Same as 2.1 item #33A.	Same as 2.1 item #13B.		0.5300	
11B	Clutch Relay	Contact Sticks closed.	Same as 2.1 item #33B.	Same as 2.1 item #14A.		0.5300	
12A	Shutdown Reset Relay Driver	Stays on.	Shutdown reset lamp signal stays active.	Shutdown reset lamp stays lit.		0.4400	
12B	Shutdown Reset Relay Driver	Stays off.	Shutdown reset lamp signal never active.	Shutdown reset lamp never lights.		0.4400	
13A	Reduction Gear Brg. Gear Engaged Relay Driver	Stays on.	Reduction gear brg. gear engaged lamp signal stays active.	Reduction gear brg. gear engaged lamp stays lit.		0.4400	
13B	Reduction Gear Brg. Gear Engaged Relay Driver	Stay off.	Reduction gear brg. gear engaged lamp signal never active.	Reduction gear brg. gear engaged lamp never lights.		0.4400	
14A	Reduction Gear Brg. Gear Engaged Alarm	Stays on.	Reduction gear brg. gear engaged alarm signal stays active.	False reduction gear brg. gear engaged alarm.		1.6535	
14B	Reduction Gear Brg. Gear Engaged Alarm	Stays off.	Reduction gear brg. gear engaged alarm signal never active.	Loss reduction gear brg. gear engaged alarm.		1.6535	
15A	Clutch Fill Solenoid	Stays open.	Same as 2.1 item #33B.	Same as 2.1 item #14A.		19.2050	
15B	Clutch Fill Solenoid	Stays closed.	Same as 2.1 item #33A.	Same as 2.1 item #13B.		19.2050	
16A	Engine Brg. Gear Engaged Alarm	Stays on.	Engine Brg. Gear Engaged Lamp signal stays active.	Engine brg. gear engaged lamp stays lit.		1.6535	
16B	Engine Brg. Gear Engaged Alarm	Stays off.	Engine Brg. Gear Engaged Lamp signal never active.	Engine brg. gear engaged lamp never lights.		1.6535	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 2.3 ENGINE AND CLUTCH CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
17A	Clutch Engaged Relay Driver	Stays on.		Clutch Engaged Lamp signal stays active.	Clutch engaged lamp stays lit.	0.4400	
17B	Clutch Engaged Relay Driver	Stays off.		Clutch Engaged Lamp signal never active.	Clutch engaged lamp never lights.	0.4400	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.1 MODE CONTROL LOGIC

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1066 HRS. COMMENTS INDEX
1A	Filter Capacitors	Fail open.		No effect (some EMI filtering capability would be lost).	No effect.	0.1998
1B	Filter Capacitors	Fail short.		Power supply to all cards shorted to ground.	Same as FMEA 1.1 item #1B.	0.8630
2A	Maneuver IPB Gate	Stays high.		Auto/split mode latch stays/ reset; also, cruise/maneuver latch stays set whenever SDG not on.	Split mode (manual) operation not possible. Lose all speed control at time of failure if split mode had been in effect. (Vessel could speed up or slow down.)	0.1052
2B	Maneuver IPB Gate	Stays low.		Lose maneuver mode select signal.	Maneuver mode could not be selected.	0.1052
3A	Cruise/Maneuver Latch	Stay set.		Maneuver mode always selected.	Lose auto and manual cruise mode. Lose all speed control at time of failure if cruise mode had been in effect (vessel could speed up or slow down).	0.3935
3B	Cruise/Maneuver Latch	Stays reset.		Cruise mode always selected.	Lose auto and manual maneuver mode. Lose all speed control at time of failure if maneuver mode had been in effect (vessel could speed up or slow down).	0.3935
4A	SDG CB Input Circuit	Output stays high.		Cruise/maneuver latch would not be reset at initialize when SDG on line.	At ERC power turn-on, the system could come up in either the cruise or maneuver mode randomly. Loss of speed control could occur at time of failure (vessel could speed up or slow down).	0.1766
4B	SDG CB Input Circuit	Output stays low.		Cruise/maneuver latch and auto/split mode latch would stay reset.	Auto cruise mode always selected. Lose all speed control at time of failure if non-auto cruise mode had been in effect (vessel could speed up or slowdown).	0.1766
5A	Latch Reset Circuit	Output stays high.		Latches could not be reset to auto cruise mode.	Lose ability to select auto cruise mode. Lose speed control if this mode selected (vessel could slow down or speed up).	0.1916
5B	Latch Reset Circuit	Output stays low.		Same as #4B.	Same as #4B.	0.1916

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.1 MODE CONTROL LOGIC

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REV. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
6A	Split IPB Input Circuit	Stays high.	Lose split IPB function.	Split mode (manual) could not be selected. Lose speed control if this mode selected (vessel could slowdown or speed up).		0.1052	
6B	Split IPB Input Circuit	Stays low.	Split IPB always appears depressed.	Split mode (manual) always selected. Lose speed control at time of failure if non-split mode had been selected. (vessel could slowdown or speed up.)		0.1052	
7A	Maneuver PB Reset Signal	Stays high.	Auto/split mode latch could not be reset by maneuver IPB.	Auto maneuver mode could not be selected. Lose speed control if this mode selected (vessel could slowdown or speed up).		0.0714	
7B	Maneuver PB Reset Signal	Stays low.	Auto/split mode latch stays reset.	Same as #2A.		0.0714	
8A	Auto/Split Mode Latch	Stays set.	Split mode always selected.	Same as #6B.		0.2883	
8B	Auto/Split Mode Latch	Stays reset.	Auto mode always selected.	Auto mode always selected. Lose all speed control at time of failure if non-auto mode had been in effect (vessel could slowdown or speed up).		0.2883	
9A	SDG On-Line Lamp Circuit	Blink enable stays active.	SDG not-on-line blink gate stays enabled.	False SDG not-on-line blinking lamp.		0.2945	
9B	SDG On-Line Lamp Circuit	Blink signal never active.	SDG not-on-line blink signal inhibited.	SDG not-on-line lamp lights steady when it should blink.		0.2209	
9C	SDG On-Line Lamp Circuit	Lamp signal stays active.	SDG not-on-line lamp signal stays active.	False SDG not-on-line steady lamp.		0.2209	
9D	SDG On-Line Lamp Circuit	Lamp signal never active.	SDG not-on-line lamp signal never active.	Lose SDG not-on-line lamp.		0.7362	
10A	Manual* Output	Stays high.	Auto-manual signal to pitch controller never active.	Same as 4.1 (Pitch Controller) FMEA item #3A.		0.1004	
10B	Manual* Output	Stays low.	Auto-manual signal to pitch controller always active.	Same as 4.1 (Pitch Controller) FMEA item #3B.		0.1004	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.1 MODE CONTROL LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
11A	Cruise* Output	Stays high.	Lose signal to bridge and ER cruise mode lamps.	Bridge and ER cruise mode lamps would not light.		0.1004	
11B	Cruise* Output	Stays low.	Bridge and ER cruise mode lamp signal stays active.	False bridge and ER cruise mode lamp indications.		0.1004	
12A	Port Idle Latch	Stays set.	E/P relay signals always inhibited.	E/P relays could not be energized--		0.2883	lose vessel propulsion.
12B	Port Idle Latch	Stays reset.	Port idle always inhibited.	Lose port idle function.		0.2883	
13A	Port Idle Latch Input	Stays high.	Port idle latch could not be set.	Same as #12B.		0.1004	
13B	Port Idle Latch Input	Stays low.	Port idle latch stays set--same as #12A.	Same as #12A.		0.1004	
14A	Port Idle IPB Gate Input	Stays high.	Port idle latch would set whenever SDG CB out and thrust lever at 0	Unselected port idle mode would occur when vessel stopped.		0.1004	
14B	Port Idle IPB Gate Input	Stays low.	Same as #13A.	Same as #12B.		0.1004	
15A	Detent* Output	Stays high.	Thrust control lever never appears at zero.	Same as Pitch Controller FMEA (4.1) item #21A.		0.1004	
15B	Detent* Output	Stays low.	Thrust control lever always appears at zero.	Same as Pitch Controller FMEA (4.1) item #21B.		0.1004	
16A	Speed Match Output	Stays high.	Same as Engine and Clutch Control FMEA (2.1) item #27A.	Same as Engine and Clutch Control FMEA (2.1) item #26B.		0.1004	
16B	Speed Match Output	Stays low.	Lose speed match enable for clutch engage when other clutch already engage.	If other clutch engaged, clutch could be engaged when speed did not match--major damage possible.			
17A	Two Engine On-Line Output	Stays high.	Both clutches always appear engaged (Relay 9 stays energized); 2-engine function gen would be switched in when only 1 engine on-line.	No effect if both engines on line. If only one engine on-line, propeller pitch control would be incorrect. Vessel speed would be lower than commanded.		0.1004	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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SUBSYSTEM: 3.1 MODE CONTROL LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1086 HRS.	COMMENTS INDEX
17B	Two Engine On-Line Output	Stays low.		Only 1 clutch always appears engaged (Relay 9 stays de-energized). 1-engine function gen. would be switched in when both engines on line.	No effect if 1 engine on line. If 2 engines on line, propeller pitch control would be incorrect. Vessel speed would be higher than commanded.	0.1004	
18A	Cruise Speed Summing Amp	Output too high.		In auto-cruise mode, P. SRC input too high.	In auto cruise mode, false full speed commands would occur.	1.4728	
18B	Cruise Speed Summing Amp	Output too low.		In auto-cruise mode, P. SRC input too low.	In auto cruise mode, false engine idle commands would occur.	1.4728	
19	Split PRM Resistor	Fails open.		Lose input signal from split RPM pot (signal opens). In split mode, P. SRC input stays too low.	In split mode, vessel would stop and speed changes via split RPM pot not possible. Other speed control modes not effected.	0.0058	
20	Trim RPM Resistor	Fails open.		Lose input signal from cruise trim RPM pot (signal opens). In cruise mode, cruise speed trim input incorrect.	In cruise mode, vessel would go slower than commanded (shaft RPM would drop).	0.0126	
21A	Speed Fail Enable	Output stays high.		Speed fail circuit always enabled.	Nuisance speed fail alarms when propulsion system not in use.	0.2008	
21B	Speed Fail Enable	Output stays low.		Speed fail circuit never enabled.	Lose speed fail alarm.	0.2008	
22A	Energize S. E/P Relay Output	Stays high.		Starboard E/P relay stays energized.	Starboard engine governor stays activated; no effect if starboard engine in use. If not in use, engine "speed-up" command would occur erroneously.	0.1004	
22B	Energize S. E/P Relay Output	Stays low.		Starboard E/P relay stays de-energized.	Starboard engine governor never activated; lose starboard engine control via automation. Engine load-sharing system would control governor.	0.1004	
23A	Energize P. E/P Relay Output	Stays high.		Port E/P relay stays energized.	Same as #22A except for port engine.	0.1004	
23B	Energize P. E/P Relay Output	Stays low.		Port E/P relay stays de-energize.	Same as #22B except for port engine.	0.1004	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

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SUBSYSTEM: 3.1 MODE CONTROL LOGIC

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
24A	Port SRC Circuit	Output too high.		Slow rate controller signal to port engine governor and to speed fail comparator too high.	Uncommanded speed increase of Port Engine. If non-failed, speed fail alarm would occur.	1.2081	
24B	Port SRC Circuit	Output too low.		Slow rate controller signal to port engine governor and to speed fail comparator too low.	Uncommanded speed decrease of Port Engine.	1.2081	
25A	Starboard SRC Circuit	Output too high.		Same as #24A except for starboard engine.	Same as #24A except for starboard engine.	1.2081	
25B	Starboard SRC Circuit	Output too low.		Same as #24B except for starboard engine.	Same as #24B except for starboard engine.	1.2081	
26	Scaled E/P Circuit	Any.		Commanded shaft speed signal to speed fail comparator circuit would be incorrect.	False speed fail alarms in ER and control fail alarms on bridge.	2.8560	
27A	Speed Fail Circuit	Output stays high.		Loss speed fail signal.	Loss speed fail alarm in ER and control fail alarm on bridge.	1.7232	
27B	Speed Fail Circuit	Output stays low.		Speed fail signal always appears active.	Same as #26.	1.7232	
28A	Control Fail* Output	Output stays high.		Control Fail signal to bridge alarm never active.	Loss control fail bridge alarm.	0.1673	
28B	Control Fail* Output	Output stays low.		Control Fail signal to bridge always active.	False control fail alarm on bridge.	0.1673	
29	Split Pot Buffer	Any.		Incorrect slow rate controller input in split mode.	In split mode, speed changes via split pot not possible and speed would be different than commanded. Other modes not effected.	2.8519	
30	ER Thrust Lever Pot Resistors	Fail open.		Loss signal from ER thrust lever (signal opens).	Thrust during maneuvering could not be controlled from the ER. If ER in control of maneuvering thrust at time of failure, all control would be lost, and pitch command would go to zero, causing vessel to stop.	0.0234	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP

SUBSYSTEM: 3.1 MODE CONTROL LOGIC

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REP. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS.	COMMENTS INDEX
31	Bridge Thrust Lever Pot Resistors	Fail open.		Loss signal from bridge thrust lever (signal opens).	Thrust during maneuvering could not be controlled from bridge. If bridge in control of maneuvering thrust at time of failure, all control would be lost, and pitch command would go to zero, causing vessel to stop.	0.0234	
32A	ER Throttle Control Pot Buffer	Output too high.		Signal from ER throttle lever too high (maneuvering mode).	Uncommand vessel speed increases when ER in control.	1.9147	
32B	ER Throttle Control Pot Buffer	Output too low.		Signal from ER throttle lever too low (maneuvering mode).	Uncommanded vessel speed decreases when ER in control; vessel would coast to a stop.	1.9147	
33	ER Throttle Position Meter Output	Any.		Signal to ER throttle position meter incorrect.	ER throttle position meter incorrect.	1.7892	
34A	Bridge Throttle Control Pot Buffer	Output too high.		Same as 32A except for bridge throttle lever.	Same as 32A except for bridge throttle lever.	1.9147	
34B	Bridge Throttle Control Pot Buffer	Output too low.		Same as 32B except for bridge throttle lever.	Same as 32B except for bridge throttle lever.	1.9147	
35	Bridge Throttle Position Meter Output	Any.		Signal to bridge throttle position meter incorrect	Bridge throttle position meter incorrect.	1.7892	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.2 MODE CONTROL INPUT INTERFACE

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REP. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10E6 HRS.	COMMENTS INDEX
1	Bridge Port Idle IPB	Fail open.	Lose Bridge Port Idle PB function.	Port Idle could not be commanded from the bridge.		0.4600	
2A	Bridge Port Idle L.R.	Stays high.	Same as #1.	Same as #1.		0.4591	
2B	Bridge Port Idle L.R.	Stays low.	Same as Mode Control Logic FMEA (3.1) item #14A.	Same as Mode Control Logic FMEA (3.1) item #14A.		0.4591	
3	ER Port Idle PB	Fail open.	Lose ER Port Idle PB function.	Port Idle could not be commanded from ER.		0.4600	
4A	ER Port Idle L.R.	Stays high.	Same as #3.	Same as #3.		0.4591	
4B	ER Port Idle L.R.	Stays low.	Same as Mode Control Logic FMEA (3.1) item #14A.	Same as Mode Control Logic FMEA (3.1) item #14A.		0.4591	
5	Cruise Mode IPB	Fails open.	Lose cruise mode PB function-- same as Mode Control Logic FMEA (3.1) item #5A.	Same as Mode Control Logic FMEA (3.1) item #5A.		0.4600	
6A	Cruise Mode L.R.	Stays high.	Same as #5.	Same as Mode Control Logic FMEA (3.1) item #5A.		0.4591	
6B	Cruise Mode L.R.	Stays low.	Same as Mode Control Logic FMEA (3.1) item #4B.	Same as Mode Control Logic FMEA (3.1) item #4B.		0.4591	
7	Maneuver Mode IPB	Fails open.	Same as Mode Control Logic FMEA (3.1) item #2B.	Same as Mode Control Logic FMEA (3.1) item #2B.		0.4600	
8A	Maneuver Mode L.R.	Stays high.	Same as Mode Control Logic FMEA (3.1) item #2B.	Same as Mode Control Logic FMEA (3.1) item #2B.		0.4591	
8B	Maneuver Mode L.R.	Stays low.	Same as Mode Control Logic FMEA (3.1) item #2A.	Same as Mode Control Logic FMEA (3.1) item #2A.		0.4591	
9	Split Mode IPB	Fails open.	Same as Mode Control Logic FMEA (3.1) item #6A.	Same as Mode Control Logic FMEA (3.1) item #6A.		0.4600	
10A	Split Mode L.R.	Stays high.	Same as Mode Control Logic FMEA (3.1) item #6B.	Same as Mode Control Logic FMEA (3.1) item #6B.		0.4591	
10B	Split Mode L.R.	Stays low.	Same as Mode Control Logic FMEA (3.1) item #6A.	Same as Mode Control Logic FMEA (3.1) item #6A.		0.4591	
11	SDG CB C14 Signal	Fails open.	Same as #12B.	Same as #12B.		0.4600	

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FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.2 MODE CONTROL INPUT INTERFACE

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RBF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE'S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
12A	SDG CB LR	Stays high.	SDG never appears on-line.	Loss inhibit against applying propulsive thrust if shaft driven generator is on-line.		0.4591	
12B	SDG CB LR	Stays low.	SDG always appears on-line.	Only cruise mode could be selected less all other modes.		0.4591	
13	SDG Clutch Engage Signal	Falls open.	SDG clutch never appears disengaged--same as Mode Control Logic (3.1) FMEA item #9D.	Same as Mode Control Logic FMEA (3.1) item #9D.		0.4600	
14A	SDG Clutch L.R.	Stays low.	Same as #13.	Same as Mode Control Logic FMEA (3.1) item #9D.		0.4591	
14B	SDG Clutch L.R.	Stays high.	SDG clutch never appears engaged--same as Mode Control Logic FMEA (3.1) item #9C.	Same as Mode Control Logic FMEA (3.1) item #9C.		0.4591	
15A	Ahead L.R.	Stays high.	Thrust levers never appear set to ahead; detent signal would go active when thrust control not at zero.	Auto pitch control would be disabled when Thrust Lever at astern.		0.4591	
15B	Ahead L.R.	Stays low.	Thrust level always appears set to ahead; detent signal never active (Detent* stays high). Same as Mode Control Logic FMEA (3.1) item #15A.	Same as Mode Control Logic FMEA (3.1) item #15A.		0.4591	
16A	Astern L.R.	Stays high.	Thrust levers never appear set to astern; detent signal would go active when thrust control not at zero.	Auto pitch control would be disabled when thrust level set to astern.		0.4591	
16B	Astern L.R.	Stays low.	Same as #15B except thrust lever always appears set to astern.	Same as Mode Control Logic FMEA (3.1) item #15A.		0.4591	
17A	ER Throttle Lever AH/AS Contacts	AH contact stays open.	Same as #15A when ER in control; no effect when bridge in control.	Same as #15A when ER in control; no effect when bridge in control.		1.4500	
17B	ER Throttle Lever AH/AS Contacts	AS contact stays open.	Same as #16A when ER in control; no effect when bridge in control.	Same as #16A when ER in control; no effect when bridge in control.		1.4500	

SHIP: SHIP C

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SUBSYSTEM: 3.2 MODE CONTROL INPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
18A	Bridge Throttle Lever, AH/AS Contacts	AH contact stays open.	Same as #15A when bridge in control; no effect when ER in control.	Same as #15A when bridge in control; no effect when ER in control.		1.4500	
18B	Bridge Throttle Lever, AH/AS Contacts	AS contact stays open.	Same as #16A when bridge in control; no effect when ER in control.	Same as #16A when bridge in control; no effect when ER in control.		1.4500	
19A	AH/AS Relay	ER AH contact stays open.	Same as #17A.	Same as #17A.		0.2650	
19B	AH/AS Relay	ER AS contact stays open.	Same as #17B.	Same as #17B.		0.2650	
19C	AH/AS Relay	Bridge AH contact stays open.	Same as #18A.	Same as #18A.		0.2650	
19D	AH/AS Relay	Bridge AS contact stays open.	Same as #18B.	Same as #18B.		0.2650	
20	Bridge Throttle Lever	Any.	Same as Mode Control Logic FMEA (3.1) item #31.	Same as Mode Control Logic FMEA (3.1) item #31.		0.9660	
21	ER Throttle Lever	Any.	Same as Mode Control Logic FMEA (3.1) item #30.	Same as Mode Control Logic FMEA (3.1) item #30.		0.9660	
22	ER Trim RPM Lever	Any.	Same as Mode Control Logic FMEA (3.1) item #29.	Same as Mode Control Logic FMEA (3.1) item #29.		0.9660	
23	ER Split RPM Lever	Any.	Same as Mode Control Logic FMEA (3.1) item #19.	Same as Mode Control Logic FMEA (3.1) item #19.		0.9660	
24	Prop Shaft RPM Tach-Generator	Loss output.	Same as Mode Control Logic FMEA (3.1) item #27B.	Same as Mode Control Logic FMEA (3.1) item #26.		19.4800	
25A	Speed Fail #1 Setpoint	Output stays high.	Same as Mode Control Logic FMEA (3.1) item #27A.	Same as Mode Control Logic FMEA (3.1) item #27A.		3.0628	
25B	Speed Fail #1 Setpoint	Output stays low.	Same as Mode Control Logic FMEA (3.1) item #27B.	Same as Mode Control Logic FMEA (3.1) item #27B.		3.0628	
26A	Speed Fail #2 Setpoint	Output stays high.	Same as Mode Control Logic FMEA (3.1) item #27A.	Same as Mode Control Logic FMEA (3.1) item #27A.		3.0628	
26B	Speed Fail #2 Setpoint	Output stays low.	Same as Mode Control Logic FMEA (3.1) item #27B.	Same as Mode Control Logic FMEA (3.1) item #27B.		3.0628	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

PAGE 1

REP. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAIL RES/ COMMENTS 1006 MRS. INDEX
1A	Speed Fail Alarm	Alarm signal stays on.	ERC speed fail alarm signal	False ERC speed fail alarm.		0.5609
1B	Speed Fail Alarm	Alarm signal stays off.	ERC speed fail alarm signal	Lose ERC speed fail alarm		0.6609
1C	Speed Fail Alarm	Non-alarm portion fails.	No effect.	No effect.		1.9827
2A	Control Fail Alarm	Alarm signal stays on.	Bridge control fail alarm signal stays active.	False bridge control fail alarm		0.6609
2B	Control Fail Alarm	Alarm signal stays off.	Bridge control fail alarm signal never active.	Lose bridge control fail alarm.		0.6609
2C	Control Fail Alarm	Non-alarm portion fails.	No effect.	No effect.		1.9827
3A	Cruise Mode Lamp Relay Driver	Stays on.	Bridge and ERC cruise mode lamp signal stays active.	False bridge and ERC cruise mode lamp indications; could create confusion.		0.4400
3B	Cruise Mode Lamp Relay Driver	Stays off.	Bridge and ERC cruise mode lamp signal never active.	Lose bridge and ERC cruise mode lamp indications; could create confusion.		0.4400
4A	Maneuver Mode Lamp Relay Driver	Stays on.	Bridge and ERC maneuver mode lamp signal stays active.	False bridge and ERC maneuver mode lamp indications; could create confusion.		0.4400
4B	Maneuver Mode Lamp Relay Driver	Stays off.	Bridge and ERC maneuver mode lamp signal never active.	Lose bridge and ERC maneuver mode lamp indications; could create confusion.		0.4400
5A	Split Mode Lamp Relay Driver	Stays on.	Bridge and ERC split mode lamp signal stays active.	False bridge and ERC split mode lamp indications; could create confusion.		0.4400
5B	Split Mode Lamp Relay Driver	Stays off.	Bridge and ERC split mode lamp signal never active	Lose bridge and ERC split mode lamp indications; could create confusion.		0.4400
6A	SDG Status Relay Driver	Stays on.	Same as Mode Control Logic (3.1) FMEA item #9C.	Same as Mode Control Logic (3.1) FMEA item #9c.		0.4400
6B	SDG Status Relay Driver	Stays off.	Same as Mode Control Logic (3.1) FMEA item #9D.	Same as Mode Control Logic (3.1) FMEA item #9D.		0.4400

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS. COMMENTS INDEX
7A	SDG Status Timer	Output stays high.	Same as Mode Control Logic (3.1) FMEA item #9C.	Same as Mode Control Logic (3.1) FMEA item #9C.		1.5
7B	SDG Status Timer	Output stays low.	Same as Mode Control Logic (3.1) FMEA item #9D.	Same as Mode Control Logic (3.1) FMEA item #9D.		1.5
8A	SDG On-Line Alarm	Alarm signal stays on.	Same as Mode Control Logic (3.1) FMEA item #9C.	Same as Mode Control Logic (3.1) FMEA item #9C.		0.6609
8B	SDG On-Line Alarm	Alarm signal stays off.	Same as Mode Control Logic (3.1) FMEA item #9D.	Same as Mode Control Logic (3.1) FMEA item #9D.		0.6609
8C	SDG On-Line Alarm	Non-alarm portion fails.	No effect.	No effect.		1.9827
9A	SDG On-Line Lamp Relay Driver	Stays on.	Same as Mode Control Logic (3.1) FMEA item #9C.	Same as Mode Control Logic (3.1) FMEA item #9C.		0.4400
9B	SDG On-Line Lamp Relay Driver	Stays off.	Same as Mode Control Logic (3.1) FMEA item #9D.	Same as Mode Control Logic (3.1) FMEA item #9D.		0.4400
10	ER Throttle Position Indicator	Any.	ER throttle position indicator reading wrong.	Lose visual ER throttle position indication.		10
11	Bridge Throttle Position Indicator	Any.	Bridge throttle position indicator reading wrong.	Lose visual bridge throttle position indication.		10
12A	Engine Speed Function Generator Filter Capacitors	Fail open.	No effect; some EMF filtering would be lost.	No effect.		0.1710
12B	Engine Speed Function Generator Filter Capacitors	Fail short.	Positive or negative 15 volt supply shorted to ground.	All speed direction control signals would be incorrect but in some indeterminate fashion. Engines would probably go to idle.		0.3286
13A	Engine Speed Function Generator	Output fails high.	High E/P signal in maneuver mode when either bridge or ER in control.	Both engines would receive max. speed commands in maneuver mode when either bridge or ER in control.		5.8754
13B	Engine Speed Function Generator	Output fails low.	Lose E/P signal in maneuver mode when either bridge or ER in control.	Both engines would slow down to idle when either bridge or ER in maneuver mode.		5.8754

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FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

PAGE 3

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1026 HRS. INDEX	COMMENTS
13C	Engine Speed Function Generator	Incorrect function		Incorrect E/P/ signal in maneuver mode when either bridge or ER in control.	Incorrect engine speed commands maneuver mode when either bridge or ER in control. Speed will be somewhat higher and/or lower than commanded.	27.4186	
14A	Cruise Mode/2 Engine Gen Filter Capacitors	Fail open.		No effect; some EMI filtering would be lost.	No effect.	0.1760	
14B	Cruise Mode/2 Engine Gen Filter Capacitors	Fail short.		Same as #12B.	Same as #12B.	0.3286	
15A	Cruise Mode/2 Engine Function Generator	Ahead circuits fail "on."		In two-engine cruise mode, erroneous full ahead command generated.	In two-engine cruise mode, vessel would erroneously go full ahead..	5.8754	
15B	Cruise Mode/2 Engine Function Generator	Astern circuits fail "on."		In two-engine cruise mode, erroneous full astern command generated.	In two engine cruise mode, vessel would erroneously go full astern.	5.8754	
15C	Cruise Mode/2 Engine Function Generator	Ahead circuits incompletely activated.		In two-engine cruise mode, ahead signals would be larger than commanded.	In two-engine cruise mode, ahead speed would be greater than commanded.	5.8754	
15D	Cruise Mode/2 Engine Function Generator	Astern circuits incompletely activated.		In two-engine cruise mode, astern signals would be larger than commanded.	In two-engine cruise mode, astern speed would be greater than commanded.	5.8754	
15E	Cruise Mode/2 Engine Function Generator	Slope of function incorrect.		In two-engine cruise mode, pitch change rates would differ from design rates.	In two-engine cruise mode, pitch changes would occur at a "bumpy" rate.	15.6678	
16A	Maneuver Mode/2 Engine Function Generator Filter Capacitors	Fail open.		No effect; some EMI filtering would be lost.	No effect.	0.1760	
16B	Maneuver Mode/2 Engine Function Generator Filter Capacitors	Fail short.		Positive or negative 15 volt supply shorted to ground.	All speed/direction control signals would be incorrect but in some indeterminate fashion. Engines would probably go to idle.	0.3286	
17A	Maneuver Mode/2 Engine Function Generator	Ahead circuits fail "on."		In two-engine maneuver mode, erroneous full ahead command generated.	In two-engine maneuver mode, vessel would erroneously go full ahead.	5.8754	

SHIP: SHIP C

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SUBSYSTEM: 1.3 MODE CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1025 HRS. INDEX	COMMENTS
17B	Maneuver Mode/2 Engine Function Generator	Astern circuits fail "on."	In two-engine maneuver mode, erroneous full astern command generated.	In two-engine maneuver mode, vessel would erroneously go full astern.		5.8754	
17C	Maneuver Mode/2 Engine Function Generator	Ahead circuits incompletely activated.	In two-engine maneuver mode, ahead signals would be larger than commanded.	In two-engine maneuver mode, ahead speed would be greater than commanded.		5.8754	
17D	Maneuver Mode/2 Engine Function Generator	Astern circuits incompletely activated.	In two-engine maneuver mode, astern signals would be larger than commanded.	In two engine maneuver mode, astern speed would be greater than commanded.		5.8754	
17E	Maneuver Mode/2 Engine Function Generator	Slope of function incorrect.	In two-engine maneuver mode, pitch change rates would differ from design rates.	In two-engine maneuver mode, pitch changes would occur at a "bumpy" rate.		15.6678	
18A	Cruise Mode/1 Engine Function Generator Filter Capacitors	Fail open.	No effect; some EMI filtering would be lost.	No effect.		0.1760	
18B	Cruise Mode/1 Engine Function Generator Filter Capacitors	Fail short.	Same as #12B.	Same as #12B.		0.3286	
19A	Cruise Mode/1 Engine Function Generator	Ahead circuits fail "on."	In one-engine cruise mode, erroneous full ahead command generated.	In one-engine cruise mode, vessel would erroneously go full ahead.		5.8754	
19B	Cruise Mode/1 Engine Function Generator	Astern circuits fail "on."	In one-engine cruise mode, erroneous full astern command generated.	In one-engine cruise mode, vessel would erroneously go full astern.		5.8754	
19C	Cruise Mode/1 Engine Function Generator	Ahead circuits incompletely activated.	In one-engine cruise mode, ahead signals would be larger than commanded.	In one-engine cruise mode, ahead speed would be greater than commanded.		5.8754	
19D	Cruise Mode/1 Engine Function Generator	Astern circuits incompletely activated.	In one-engine cruise mode, astern signals would be larger than commanded.	In one-engine cruise mode, astern speed would be greater than commanded.		5.8754	
19E	Cruise Mode/1 Engine Function Generator	Slope of function incorrect.	In one-engine cruise mode, pitch change rates would differ from design rates.	In one-engine cruise mode, pitch changes would occur at a "bumpy" rate.		15.6678	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1926 NRS.	COMMENTS INDEX
20A	Maneuver Mode/1 Engine Function Generator Filter Capacitors	Fail open.		No effect; some EMI filtering would be lost.	No effect.	0.1760	
20B	Maneuver Mode/1 Engine Function Generator Filter Capacitors	Fail short.		Same as #12B.	Same as #12B.	0.3286	
21A	Maneuver Mode/2 Engine Function Generator	Ahead circuits fail "on."		In one-engine maneuver mode, erroneous full ahead command generated.	In one-engine maneuver mode, vessel would erroneously go full ahead.	5.8754	
21B	Maneuver Mode/2 Engine Function Generator	Astern circuits fail "on."		In one-engine maneuver mode, erroneous full astern command generated.	In two-engine maneuver mode, vessel would erroneously go full astern.	5.8754	
21C	Maneuver Mode/2 Engine Function Generator	Ahead circuits incompletely activated.		In one-engine maneuver mode, ahead signals would be larger than commanded.	In two-engine maneuver mode, ahead speed would be greater than commanded.	5.8754	
21D	Maneuver Mode/2 Engine Function Generator	Astern circuits incompletely activated.		In one-engine maneuver mode, astern signals would be larger than commanded.	In two engine maneuver mode, astern speed would be greater than commanded.	5.8754	
21E	Maneuver Mode/2 Engine Function Generator	Slope of function incorrect.		In one-engine maneuver mode, pitch change rates would differ from design rates.	In two-engine maneuver mode, pitch changes would occur at a "bumpy" rate.	15.6678	
22A	Throttle Control Pot Relay	NO contact sticks open.		Loss signal from bridge throttle lever to engine speed function generator.	Same as FMEA 3.1 item #34B.	0.2650	
22B	Throttle Control Pot Relay	NO contact sticks closed.		Signal from bridge throttle lever always connected to engine speed function generator.	No effect when control is via bridge throttle lever. When control is via ER throttle lever, speed would be higher and/or lower than commanded.	0.2650	
22C	Throttle Control Pot Relay	NC contact sticks open.		Loss signal from ER throttle lever to engine speed function generator.	Same as FMEA 3.1 item #32B.	0.2650	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1086 HRS.	COMMENTS INDEX
22D	Throttle Control Pot Relay	NC contact sticks closed.		Signal from ER throttle lever always connected to engine speed function generator.	No effect when control is via ER throttle lever. When control is via bridge throttle lever, speed would be higher and/or lower than commanded.	0.2650	
23A	Cruise Pot Relay	NO contact sticks open.		Lose signal from ER trim RPM pot (cruise) to E/P input--same as Mode Control FMEA 3.1 item #20.	Same as FMEA 3.1 item #20.	0.2650	
23B	Cruise Pot Relay	NO contact sticks closed.		Signal from ER trim RPM pot always connected; lose signal from engine speed function generator.	No effect in cruise mode. In maneuver mode, same as FMEA 3.3 item #13B.	0.2650	
23C	Cruise Pot Relay	NC contact sticks open.		Lose signal from engine speed function generator.	Same as FMEA 3.1 item #13B.	0.2650	
23D	Cruise Pot Relay	NC contact sticks closed.		Signal from engine speed function generator always connected; lose signal from ER trim RPM (cruise) pot.	No effect in maneuver mode. In cruise mode, speed would be higher and/or lower than commanded.	0.2650	
24A	Split Mode Relay	NO contact sticks open.		Lose signal from ER split RPM pot to E/P input #20.	Same as FMEA 3.1 item #19.	0.2650	
24B	Split Mode Relay	NO contact sticks closed.		Signal from ER split RPM pot always connected; lose signals from ER trim RPM (cruise) pot and engine speed function generator.	No effect in split mode. In cruise and maneuver modes, both engines would slow down to idle.	0.2650	
24C	Split Mode Relay	NC contact sticks open.		Lose signals from ER trim RPM (cruise) pot and engine speed function generator.	Same as #24B.	0.2650	
24D	Split Mode Relay	NC contact sticks closed.		Signal from ER trim RPM (cruise) pot or engine speed function generator always connected; lose signal from ER split RPM pot.	Same as Mode Control FMEA 3.1 item #19.	0.2650	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

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REP. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 100% BRS.	COMMENTS INDEX
25A	Function Generator Relay #4	#1 NC contact sticks open.		Lose output signal from two engine-cruise mode function generator.	In two-engine cruise mode, vessel would coast to a stop and later (over a long time period) small, uncommanded speed changes would occur.	0.1325	
25B	Function Generator Relay #4	#1 NC contact sticks closed.		Signal from two engine-cruise mode function generator always connected; lose signal from two engine-maneuver mode.	In two-engine maneuver mode, vessel would coast to a stop and later (over a long time period) small, uncommanded speed changes would occur.	0.1325	
25C	Function Generator Relay #4	#1 NO contact sticks open.		Lose signal from two engine-maneuver mode function generator.	Same as #25B.	0.1325	
25D	Function Generator Relay #4	#1 NO contact sticks closed.		Signal from two engine-maneuver mode function generator always connected; lose signal from two engine-cruise mode function generator.	Same as #25A.	0.1325	
25E	Function Generator Relay #4	#2 NC contact sticks open.		Lose signal from one engine-cruise mode function generator.	In one-engine cruise mode, vessel would coast to a stop and later (over a long time period) small, uncommanded speed changes would occur.	0.1325	
25F	Function Generator Relay #4	#2 NC contact sticks closed.		Signal from one engine-cruise mode function generator always connected; lose signal from one engine/maneuver mode function generator.	In one-engine maneuver mode, vessel would coast to a stop and later (over a long time period) small, uncommanded speed changes would occur.	0.1325	
25G	Function Generator Relay #4	#2 NO contact sticks open.		Lose signal from one engine-maneuver mode function generator.	Same as #25F.	0.1325	
25H	Function Generator Relay #4	#2 NO contact sticks closed.		Signal from one engine-maneuver mode function generator always connected; lose signal from one engine-cruise mode function generator.	Same as #25E.	0.1325	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1006 HRS. INDEX	COMMENTS INDEX
26A	Port E/P Relay	#1 NC contact sticks open.	Port E/P input would not be grounded when port E/P relay should be de-energized.	Port engine would go to idle.		0.1325	
26B	Port E/P Relay	#1 NC contact sticks closed.	Port E/P input stays grounded.	Same as Mode Control FMEA 3.1 item #22B.		0.1325	
26C	Port E/P Relay	#1 NO contact sticks open.	Loss SRC signal to port E/P input.	Same as #26A.		0.1325	
26D	Port E/P Relay	#1 NO contact sticks closed.	SRC signal always connected to port E/P input	No effect--normal position when vessel underway.		0.1325	
26E	Port E/P Relay	#2 NC contact sticks open.	Loss signal to bridge port idle lamp.	Loss bridge port idle lamp indication.		0.1325	
26F	Port E/P Relay	#2 NC contact sticks closed.	Signal to bridge port idle lamp stays active.	False bridge port idle lamp indication.		0.1325	
26G	Port E/P Relay	#2 NO contact sticks open.	No effect.	No effect.		0.1325	
26H	Port E/P Relay	#2 NO contact sticks closed.	Same as #26E.	Same as #26E.		0.1325	
27A	Stbd E/P Relay	#1 NC contact sticks open.	Stbd E/P input would not be grounded when stbd E/P relay should be de-energized.	Stbd engine would go to idle.		1.0600	
27B	Stbd E/P Relay	#1 NC contact sticks closed.	Stbd E/P input stays grounded.	Same as Mode Control FMEA 3.1 item #22B.		1.0600	
27C	Stbd E/P Relay	#1 NO contact sticks open.	Loss SRC signal to stbd E/P input.	Same as #26A.		1.0600	
27D	Stbd E/P Relay	#1 NO contact sticks closed.	SRC signal always connected to stbd E/P input	No effect--normal position when vessel underway.		1.0600	
27E	Stbd E/P Relay	#2 NC contact sticks open.	Loss signal to bridge port idle lamp.	Loss bridge port idle lamp indication.		1.0600	
27F	Stbd E/P Relay	#2 NC contact sticks closed.	Signal to bridge port idle lamp stays active.	False bridge port idle lamp indication.		1.0600	
27G	Stbd E/P Relay	#2 NO contact sticks open.	No effect.	No effect.		1.0600	

FAILURE MODES AND EFFECTS ANALYSIS (PMEA)

SHIP: SHIP C

SUBSYSTEM: 3.3 MODE CONTROL OUTPUT INTERFACE

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REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
27H	Stbd E/P Relay	#2 NO contact sticks closed.	Same as #26E.	Same as #26E.		1.0600	
28A	Function Generator Relay #9	NC contact sticks open.	Lose signals from one engine-cruise mode and one engine-maneuver mode function generators.	In one-engine cruise and maneuver modes, vessel would coast to a stop and later (over a long time period) small, uncommanded speed changes would occur.		0.2650	
28B	Function Generator Relay #9	NC contact sticks closed.	Signal from one engine-cruise mode or one engine-maneuver mode function generator always connected; lose signals from two engine-cruise mode and two engine-maneuver mode function generators.	In two-engine cruise and maneuver modes, incorrect response would occur on direction change commands.		0.2650	
28C	Function Generator Relay #9	NO contact sticks open.	Lose signals from two engine-cruise mode and two engine-maneuver mode function generators.	In two-engine cruise and maneuver modes, vessel would coast to a stop and later (over a long time period) small, uncommanded speed changes would occur.		0.2650	
28D	Function Generator Relay #9	NO contact sticks closed.	Signal from two engine-cruise mode or two engine-maneuver mode function generators always connected; lose signals from one engine-cruise mode and one engine-maneuver mode function generators.	In one-engine cruise and maneuver modes, incorrect response would occur on direction change commands.		0.2650	
29A	Auto Pitch Relay	NC contact sticks open.	Auto pitch signal not grounded when pitch not enabled.	When vessel not underway, small erroneous speed commands would occur.		0.2650	
29B	Auto Pitch Relay	NC contact sticks closed.	Auto pitch signal always grounded.	Prop would go to flat pitch and vessel would coast to a stop.		0.2650	
29C	Auto Pitch Relay	NO contact sticks open.	Lose signals from all cruise/maneuver mode function generators.	In any mode, vessel would coast to a stop and later (over a long time period) small, uncommanded changes would occur.		0.2650	
29D	Auto Pitch Relay	NO contact sticks closed.	Cruise/maneuver mode function generators would remain connected when pitch not enabled.	Same as #29A.		0.2650	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.1 PITCH CONTROLLER

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
1A	Filter Capacitors	Fail open.		No effect; lose some EMI filtering capability.	No effect.	0.4453	
1B	Filter Capacitors	Fail short.		+5 volt or +15 or -15 volt power to all cards shorted to ground.	Same as FMEA 1.1 item 11B.	0.4040	
2A	Rate Ltd Pitch Command	Ahead signal stays max.		Full ahead command continuously generated.	Vessel would go full ahead regardless of what had been commanded.	0.9091	
2B	Rate Ltd Pitch Command	Astern signal stays max.		Full astern command continuously generated.	Vessel would go full astern regardless of what had been commanded.	0.9091	
2C	Rate Ltd Pitch Command	Slew rate incorrect.		Pitch change commands would occur at rate higher than designed for.	High change rate on pitch change commands. Limits would still be imposed by propeller system itself.	0.2218	
2D	Rate Ltd Pitch Command	Crash astern rates stay inhibited.		Rate limiting would be imposed on crash astern commands.	Crash astern commands would be carried out too slow.	0.1330	
3A	Pitch Command Summing Gate	Stays on.		Manual increased slow rate ahead circuit would stay active.	Same as #2C.	0.6769	
3B	Pitch Command Summing Gate	Stays off.		Lose manual increased slow rate ahead circuit.	In manual mode, ahead pitch changes would not occur at increased rate.	0.6769	
4A	Slew Rate Controller	Fails high.		Same as #2A.	Same as #2A.	0.9892	
4B	Slew Rate Controller	Fails low.		Same as #2B.	Same as #2B.	0.9892	
5A	Actual Pitch AH Input Circuit	Output stays high.		FET Q3 stays off; same as #3A.	Same as #3A.	0.2139	
5B	Actual Pitch AH Input Circuit	Output stays low.		FET Q3 stays on; same as #3B.	Same as #3B.	0.2139	
6A	Command/Actual Pitch Input Circuit	Output stays high.		FET Q4 stays off; same as #2D.	Same as #2D.	0.2931	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.1 PITCH CONTROLLER

PAGE: 2

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ COMMENTS LOGS HRS. INDEX
6B	Command/Actual Pitch Input Circuit	Output stays low.	FET Q4 stays on; crash astern rates would be imposed on all commanded pitch changes.	Same as #2C.		0.2931
7A	Pitch Pos Feedback Buff	Ahead signal stays max.	Actual pitch position signal to pitch error circuit fails to limits in ahead direction.	Vessel would immediately go full ahead; thereafter, lose auto pitch control capability (all operating modes).		1.4675
7B	Pitch Pos Feedback Buff	Astern signal stays max.	Actual pitch position signal to pitch error circuit fails to limits in astern direction.	Vessel would immediately go full astern; thereafter, lose auto pitch control capability (all operating modes).		1.4675
8A	Split Pitch Command Circuit	Ahead signal stays max.	In split mode, full ahead command always active.	In split mode, vessel would immediately go full ahead.		1.7347
8B	Split Pitch Command Circuit	Astern signal stays max.	In split mode, full astern command always active.	In split mode, vessel would immediately go full astern.		1.7347
8C	Split Pitch Command Circuit	Loss output.	Split mode commands never active.	No pitch control possible in split mode.		0.3855
9A	Pitch Error Output	Ahead signal stays max.	Signal to pitch servo amplifier always at full ahead.	Vessel would immediately go full ahead (any operating mode).		0.9130
9B	Pitch Error Output	Astern signal stays max.	Signal to pitch servo amplifier always at full astern.	Vessel would immediately go full astern (any operating mode).		0.9130
10A	Split Pitch Command Inverter	Ahead signal stays max.	Same as #9A.	Same as #9A.		1.4145
10B	Split Pitch Command Inverter	Astern signal stays max.	Same as #9B.	Same as #9B.		1.4145
11A	Split Pitch/Auto Gate	Stays on.	Split pitch command always active; could be added to auto command in auto mode.	No effect in split mode. In auto mode, if split pot not set to zero position, uncommanded pitch changes would occur, with the direction and magnitude depending on the position of the split mode pot.		0.3255
11B	Split Pitch/Auto Gate	Stays off.	Loss split pitch commands; in split mode, all pitch commands would stay at zero.	In split mode, vessel would go into "neutral" and stop; no further split mode control possible.		0.3255

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.1 PITCH CONTROLLER

PAGE: 3

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 10% MRS.	COMMENTS INDEX
12A	Auto Input Circuit	Fails high.	Auto mode never appears selected; commanded pitch/auto gate stays off.	Same as #13A.		0.0772	
12B	Auto Input Circuit	Fails low.	Auto mode always appears selected; commanded pitch/auto gate stays on.	Same as #13B.		0.0772	
13A	Commanded Pitch/ Auto Gate	Stays off.	Commanded pitch signal never selected.	In auto and maneuver modes, vessel would go into neutral and stop. No further auto and maneuver modes control possible.		0.1097	
13B	Commanded Pitch/ Auto Gate	Stays on.	Commanded pitch signal always selected.	In split mode, if throttle levers not set to zero position, uncommanded pitch changes would occur with the direction and magnitude depending on the positions of the throttle levers.		0.1097	
14A	Actual Pitch Circuit	Actual pitch signal fails high	Same as #16A.	Same as #2D.		0.9362	
14B	Actual Pitch Circuit	Actual pitch signal fails low.	Same as #16B.	Same as #2C.		0.9362	
15	Pitch Meter Output	Any.	Signals to bridge and ERC pitch indicators incorrect.	Loss bridge and ERC visual pitch position indicators.		1.7892	
16A	Feedback Pot Supply, Pos	Fails high.	Loss calibration throttle levers.	"Bumpy" pitch changes.		1.4154	
16B	Feedback Pot Supply, Pos	Fails low.	Loss positive voltage to pitch control op-amps.	If vessel going ahead, failure will cause it to go full astern.		1.4154	
17A	Feedback Pot Supply, Pos	Fails high.	Loss negative voltage to pitch control op-amps.	If vessel going astern, failure will cause it to go full ahead.		1.4154	
17B	Feedback Pot Supply, Pos	Fails low.	Same as #16A.	Same as #16A.		1.4154	
18A	Flat Pitch Output	Stays high.	Pitch always appears flat.	Loss inhibit against engaging clutch if propeller pitch not flat.		0.1052	
18B	Flat Pitch Output	Stays low.	Pitch never appears flat.	Clutch could not be engaged.		0.1052	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.1 PITCH CONTROLLER

PAGE: 4

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS. INDEX	COMMENTS INDEX
19A	Pitch Fail Timer	Output stays high.	Pitch fail signal stays active.	False bridge and ERC pitch fail alarms.		1.4647	
19B	Pitch Fail Timer	Output stays low.	Pitch fail signal never active.	Loss bridge and ERC pitch fail alarms.		1.4647	
20A	Pitch Error Input	Stays high.	Same as #19B.	Same as #19B.		0.1052	
20B	Pitch Error Input	Stays low.	Same as #19A.	Same as #19A.		0.1052	
21A	Detent* Input	Stays high.	Enable pitch signal stays inhibited; auto pitch command signal would stay at ground.	Same as FMEA 3.3 item #29B.		0.1445	
21B	Detent* Input	Stays low.	Auto pitch command signal could be enabled when engines below proper speed.	Pitch commands would not be inhibited if vessel not underway.		0.1445	
22A	Enable Pitch Output	Stays high.	Auto pitch relay stays energized; cruise/maneuver mode function generator outputs would be applied to Rate Limited Pitch Command circuit continuously.	Same as #21B.		0.1052	
22B	Enable Pitch Output	Stays low.	Auto pitch relay stays de-energized; auto pitch command to Rate Limited Pitch Command circuit stays at ground.	Same as FMEA 3.3 item #29B.		0.1052	
23A	Engine Below N.I.* Input	Stays high.	Same as #22B.	Same as FMEA 3.3 item #29B.		0.1052	
23B	Engine Below N.I.* Input	Stays low.	Engine speed always appears above N.I.; auto pitch command signal could be enabled when engine speed not above N.I.	Same as #21B.		0.1052	
24	Split Pitch Pot Resistors	Fail open.	Loss split pitch command from split pitch pot.	In split mode, vessel would coast to a stop and no further pitch control possible. Other modes not effected.		0.0504	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.1 PITCH CONTROLLER INPUT INTERFACE

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
1A	Pitch Error #1 Setpoint Channel	Stays on.	Same as Pitch Controller (4.1) FMEA item #19A.	Same as Pitch Controller (4.1) FMEA item #19A.		3.0630	
1B	Pitch Error #1 Setpoint Channel	Stays off.	Lose pitch fail alarm signal for low pitch error.	Lose bridge and ERC pitch fail alarm for low pitch error.		3.0630	
2A	Pitch Error #2 Setpoint Channel	Stays on.	Same as Pitch Controller (4.1) FMEA item #19A.	Same as Pitch Controller (4.1) FMEA item #19A.		3.0630	
2B	Pitch Error #2 Setpoint Channel	Stays off.	Lose pitch fail alarm signal for high pitch error.	Lose bridge and ERC pitch fail alarm for high pitch error.		3.0630	
3	Split Pitch Pot	Any.	Same as Pitch Controller (4.1) FMEA item #24.	Same as Pitch Controller (4.1) FMEA item #24.		0.9660	
4A	Actual Pitch Pos. Setpoint Channel	Stays on.	Crash astern rates would be enabled during any astern commands.	All astern commands would be carried out at crash astern rates.		3.0630	
4B	Actual Pitch Pos. Setpoint Channel	Stays off.	Crash astern gate stays inhibited.	Same as FMEA 4.1 item #2D.		3.0630	
5A	Actual Pitch Neg. Setpoint Channel	Stays on.	Same as Pitch Controller (4.1) FMEA item #18B.	Same as Pitch Controller (4.1) FMEA item #18B.		3.0630	
5B	Actual Pitch Neg. Setpoint Channel	Stays off.	Actual pitch never appears astern.	Lose inhibit against engaging clutch if propeller pitch astern.		3.0630	
6A	Bridge Wings AS Ind. Signal Relay Driver	Stays on.	Bridge wings AS indicator signal always active.	False AS indication on bridge wings.		0.4380	
6B	Bridge Wings AS Ind. Signal Relay Driver	Stays off.	Bridge wings AS indicator signal never active.	Lose AS indication on bridge wings.		0.4380	
7A	Bridge Wings AB Ind. Signal Relay Driver	Stays on.	Bridge wings AB indicator signal always active.	False AB indication on bridge wings.		0.4380	
7B	Bridge Wings AB Ind. Signal Relay Driver	Stays off.	Bridge wings AB indicator signal never active.	Lose AB indication on bridge wings.		0.4380	
8	BR DDT AB/AS Limit Switch	Any.	Lose wrong direction pitch alarm signal.	Lose ERC and bridge wrong direction pitch alarm.		0.9200	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.2 PITCH CONTROLLER INPUT INTERFACE

PAGE: 2

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
8A	Wrong Direction Pitch Alarm	Stays on.	ERC wrong direction pitch alarm signal stays active.	False ERC wrong direction pitch alarm.		1.0310	
9B	Wrong Direction Pitch Alarm	Stays off.	Lose ERC wrong direction pitch alarm signal.	Lose ERC wrong direction pitch alarm signal.		1.0310	
9C	Wrong Direction Pitch Alarm	Alarm signal stays on.	Bridge wrong direction pitch alarm signal stays active.	False bridge wrong direction pitch alarm.		0.6073	
9D	Wrong Direction Pitch Alarm	Alarm signal stays off.	Lose bridge wrong direction pitch alarm signal.	Lose bridge wrong direction pitch alarm.		0.6073	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.3 PITCH CONTROLLER OUTPUT INTERFACE

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS.	COMMENTS INDEX
1A	Pitch Fail Relay Driver	Stays on.		Pitch fail relay stays energized; circuit to skinner valve stays made.	Pitch changes would occur at higher than normal change rates.	0.4400	
1B	Pitch Fail Relay Driver	Stays off.		Pitch fail relay cannot be energized; circuit to skinner valve stays open.	No effect.	0.4400	
2A	Pitch Fail Relay	Contact sticks open.		Circuit to skinner valve stays open.	No effect.	0.5300	
2B	Pitch Fail Relay	Contact sticks closed.		Circuit to skinner valve stays closed.	Same as #1A.	0.5300	
3A	Pitch Fail Alarm	Alarm signal stays on.		Pitch fail alarm signal stays active.	False ERC pitch fail alarm.	0.9881	
3B	Pitch Fail Alarm	Alarm signal stays off.		Pitch fail alarm signal never active.	Loss ERC pitch fail alarm.	0.9881	
3C	Pitch Fail Alarm	Non-alarm portion fails.		No effect.	No effect.	2.9643	
4	Pitch Indicator	Any.		Bridge and ERC pitch indicators incorrect.	Bridge and ERC pitch indicators incorrect.	10	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.4 PITCH CUTBACK

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ COMMENTS 1005 ERS. INDEX
1A	Filter Capacitors	Fail open.		No effect; lose some EMI filtering.	No effect.	0.3926
1B	Filter Capacitors	Fail short.		Plus or minus 15v or 24v supply shorted to ground.	Same as FMEA 1.1 item #1B.	0.7332
2A	Pitch Limit Circuit	Fails high.		System will "think" there is too much fuel rack and cutback on pitch.	Vessel will slowdown.	3.5630
2B	Pitch Limit Circuit	Fails low.		Lose ability to sense the load on the engines.	If an engine overload condition occurred, the automation system would not command a pitch cutback to reduce the load. Non-automation system overload protection provided on engines.	3.5630
3A	Pitch Cutback Circuit	Fails high.		Same as #2B.	Same as #2B.	1.9525
3B	Pitch Cutback Circuit	Fails low.		Same as #2A.	Same as #2A.	1.9525
4A	Shaft RPM Circuit	Fails high.		Same as #2B.	Same as #2B.	0.9152
4B	Shaft RPM Circuit	Fails low.		Same as #2A.	Same as #2A.	0.9352
5A	Pitch Servo Output	positive output stays low.		Astern command stays active.	Erroneous full astern command continuously.	0.7918
5B	Pitch Servo Output	Positive output stays high.		Astern command never active.	Lose ability to go astern.	0.3391
5C	Pitch Servo Output	Negative output stays low.		Ahead command stays active.	Erroneous full ahead command continuously.	0.7918
5D	Pitch Servo Output	Negative output stays high.		Ahead command never active.	Lose ability to go ahead.	0.3391
6A	Port LVDT Circuit	Output stays high.		Same as #2A.	Same as #2A.	0.9388
6B	Port LVDT Circuit	Output stays low.		Same as #2B except for port engine only.	Same as #2B except for port engine only.	0.9388

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FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.4 PITCH CUTBACK

PAGE: 2

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1066 BRS.	COMMENTS INDEA
7A	Stbd LVDT Circuit	Output stays high.	Same as #2A.	Same as #2A.		0.9388	
7B	Stbd LVDT Circuit	Output stays low.	Same as #2B except for stbd engine only.	Same as #2B except for stbd engine only.		0.9388	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 4.5 PITCH CUTBACK INPUT INTERFACE

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE/S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 1000 HRS. INDEX	COMMENTS
1A	Port LVDT	Output too high.	Same as FMEA #4.4 item #2A.	Same as FMEA #4.4 item #2A.		10.3500	
1B	Port LVDT	Output too low.	Same as FMEA #4.4 item #6B.	Same as FMEA #4.4 item #6B.		10.3500	
2A	Stbd LVDT	Output too high.	Same as FMEA #4.4 item #2A.	Same as FMEA #4.4 item #2A.		10.3500	
2B	Stbd LVDT	Output too low.	Same as FMEA #4.4 item #7B.	Same as FMEA #4.4 item #7B.		10.3500	
3A	LVDT Pos. Setpoint	Stays on.	Same as FMEA #4.4 item #2A.	Same as FMEA #4.4 item #2A.		3.4198	
3B	LVDT Pos. Setpoint	Stays off.	Same as FMEA #4.4 item #2B.	Same as FMEA #4.4 item #2B.		3.4198	
4A	LVDT Pos. Relay Driver	Stays on.	Same as FMEA #4.4 item #2A.	Same as FMEA #4.4 item #2A.		0.2415	
4B	LVDT Pos. Relay Driver	Stays off.	Same as FMEA #4.4 item #2B.	Same as FMEA #4.4 item #2B.		0.2415	

FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

SHIP: SHIP C

SUBSYSTEM: 1.3 CONTROL POWER SUPPLY

PAGE: 1

REF. NO.	ITEM NOMENCLATURE FUNCTION	FAILURE MODE, S	SUBSYSTEM	FAILURE MODES	SYSTEM	FAILURES/ 100% HRS.	COMMENTS INDEX
1	Console Power Supply #1 (redundant to unit #2 below)	Any.		Loss of or incorrect power out- put from unit.	No effect unless redundant unit failed. If both failed, control system would shut down and vessel would come to a stop.	9.2600	
2	Console Power Supply #2 (redundant to unit #1 above.)	Any.		Same as #1.	Same as #1.	9.2600	

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APPENDIX E
FAULT TREES

SHIP

PAGE

A

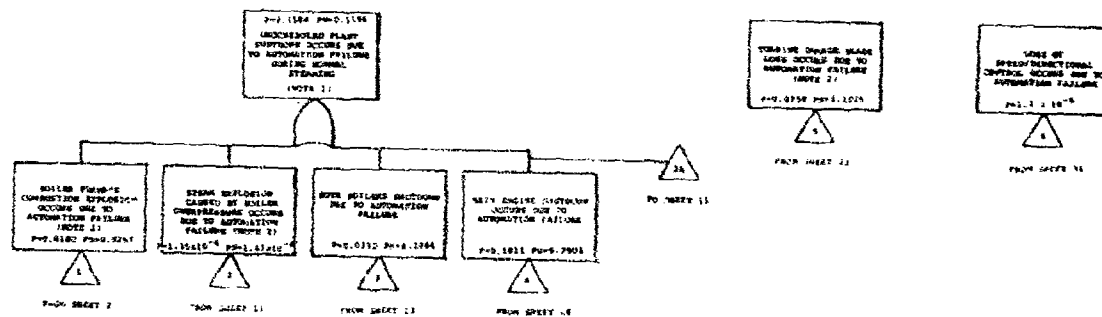
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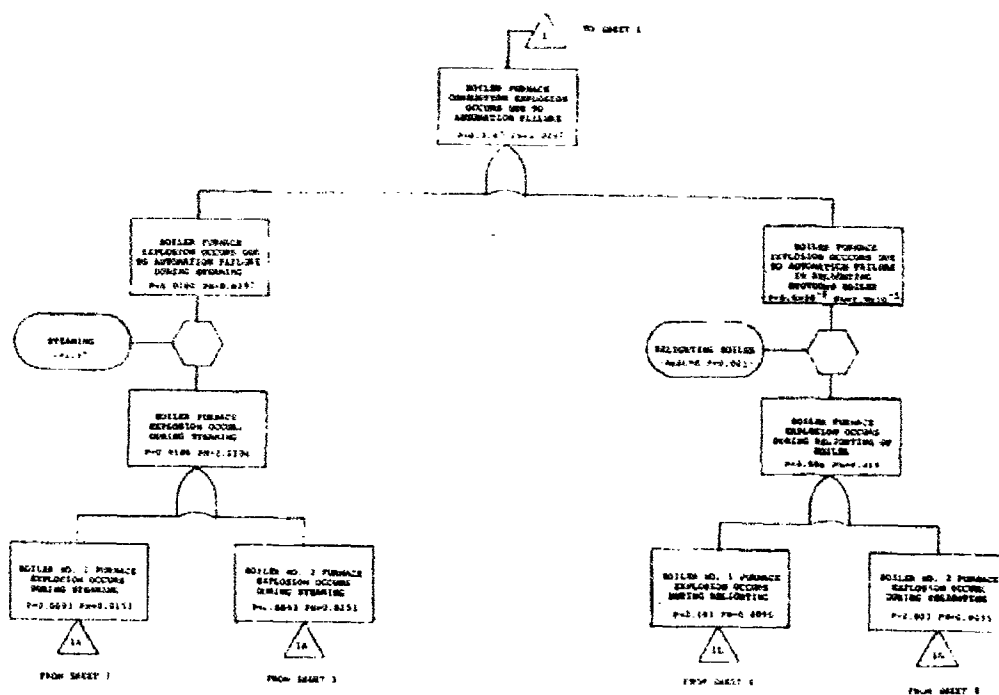
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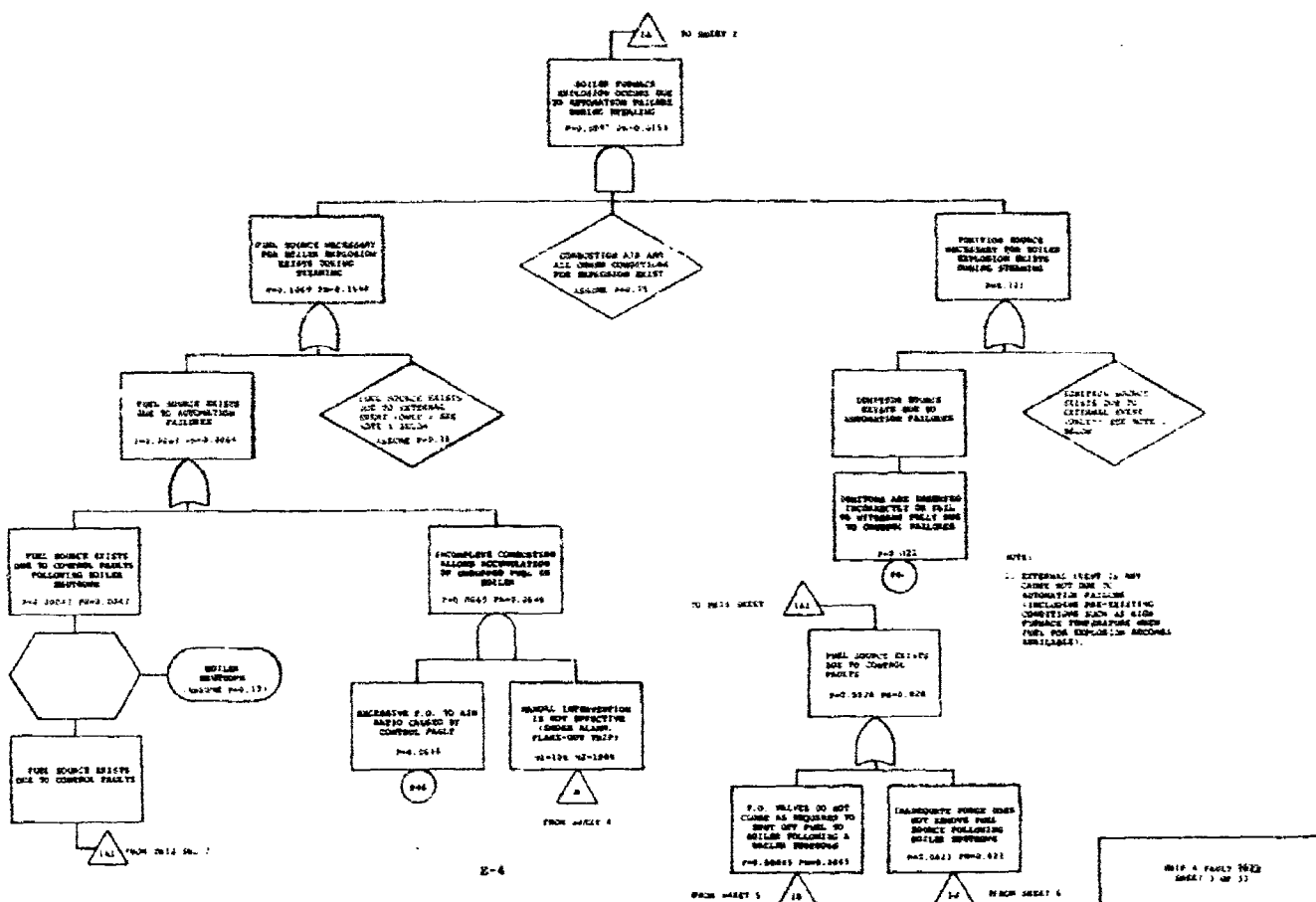
E-63

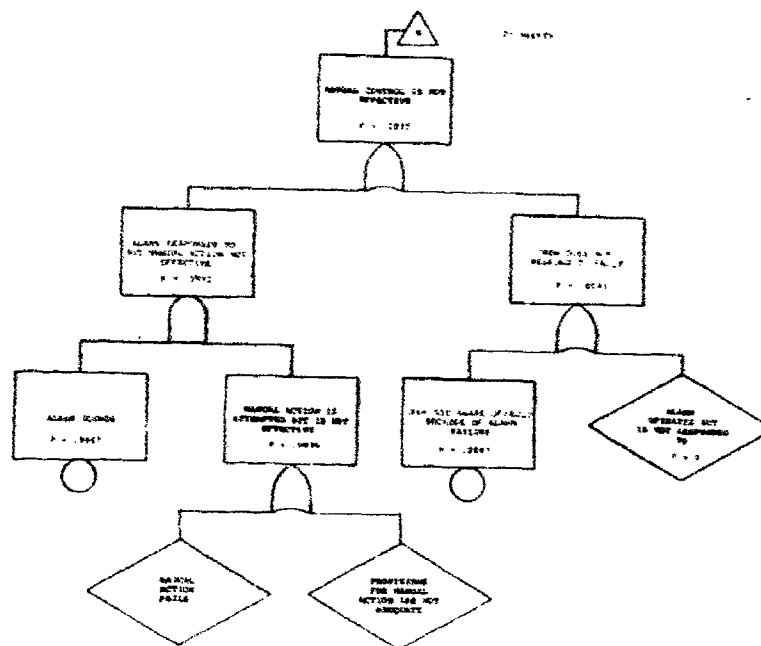


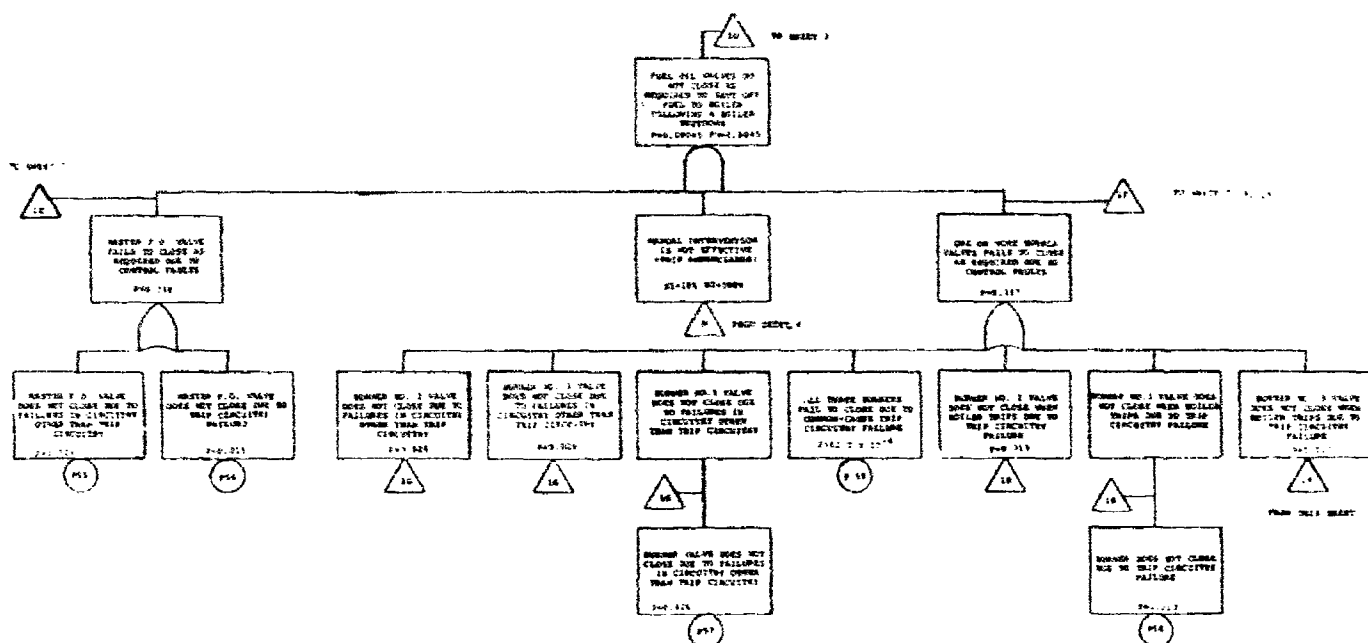
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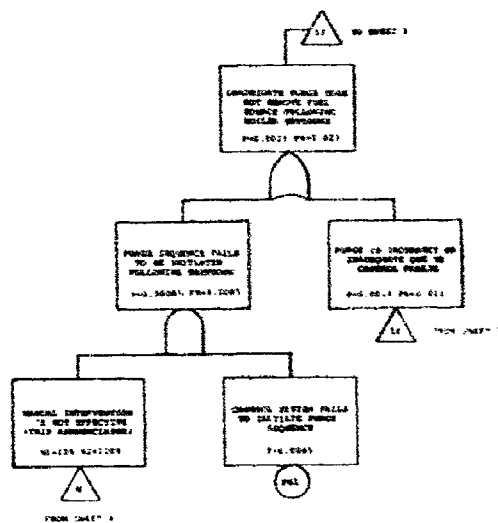
1. REACTOR PLANT SHUTDOWN CAN OCCUR DUE TO SIGNIFICANT IMPROVE AS WELL AS DUE TO SHUTDOWN OF STEAM SUPPLY WITH ENGINE.
2. POTENTIAL EXISTS FOR CHAIN FAILURE, CONDITIONAL IN LOCATIONS OF CHAIN MEMBERS.
3. THE "P" COVER THE SITUATION WHERE MANUAL INTERVENTION AT DETECTION OF THE TIME THE "P" COVER THE SITUATION WHERE MANUAL INTERVENTION IS NEVER EFFECTIVE.

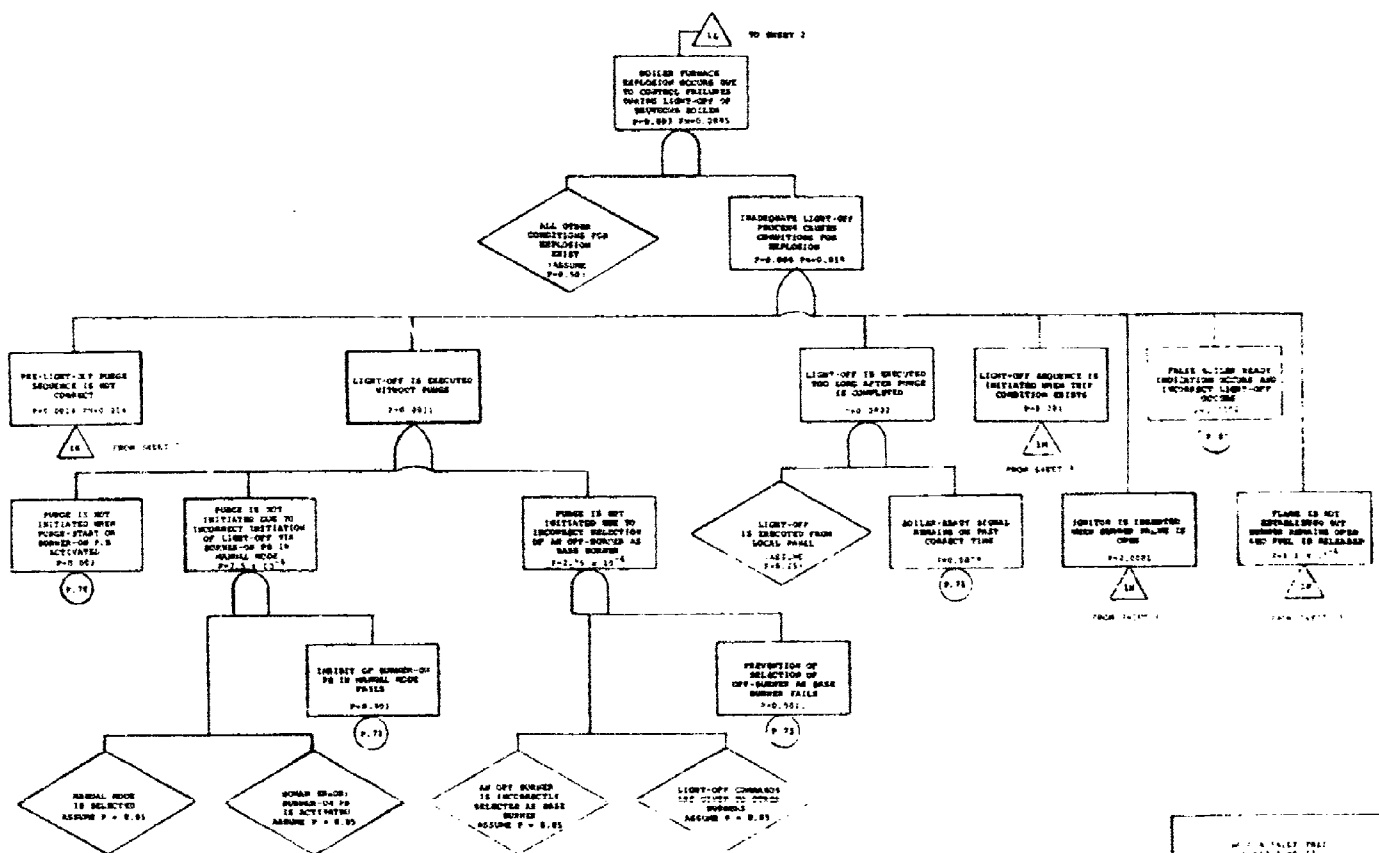




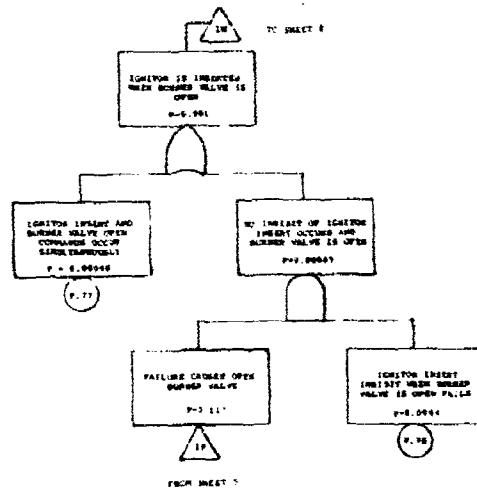
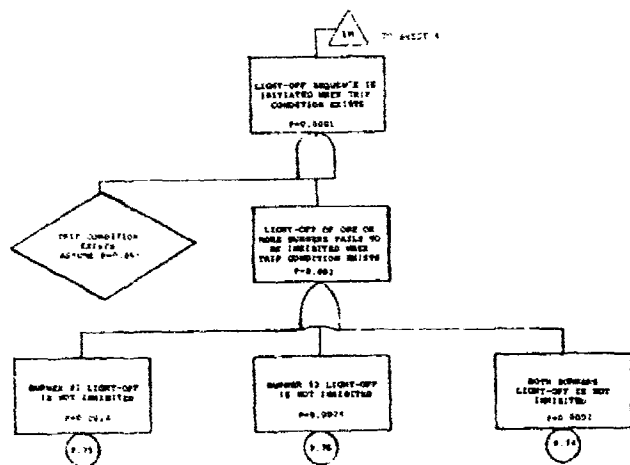


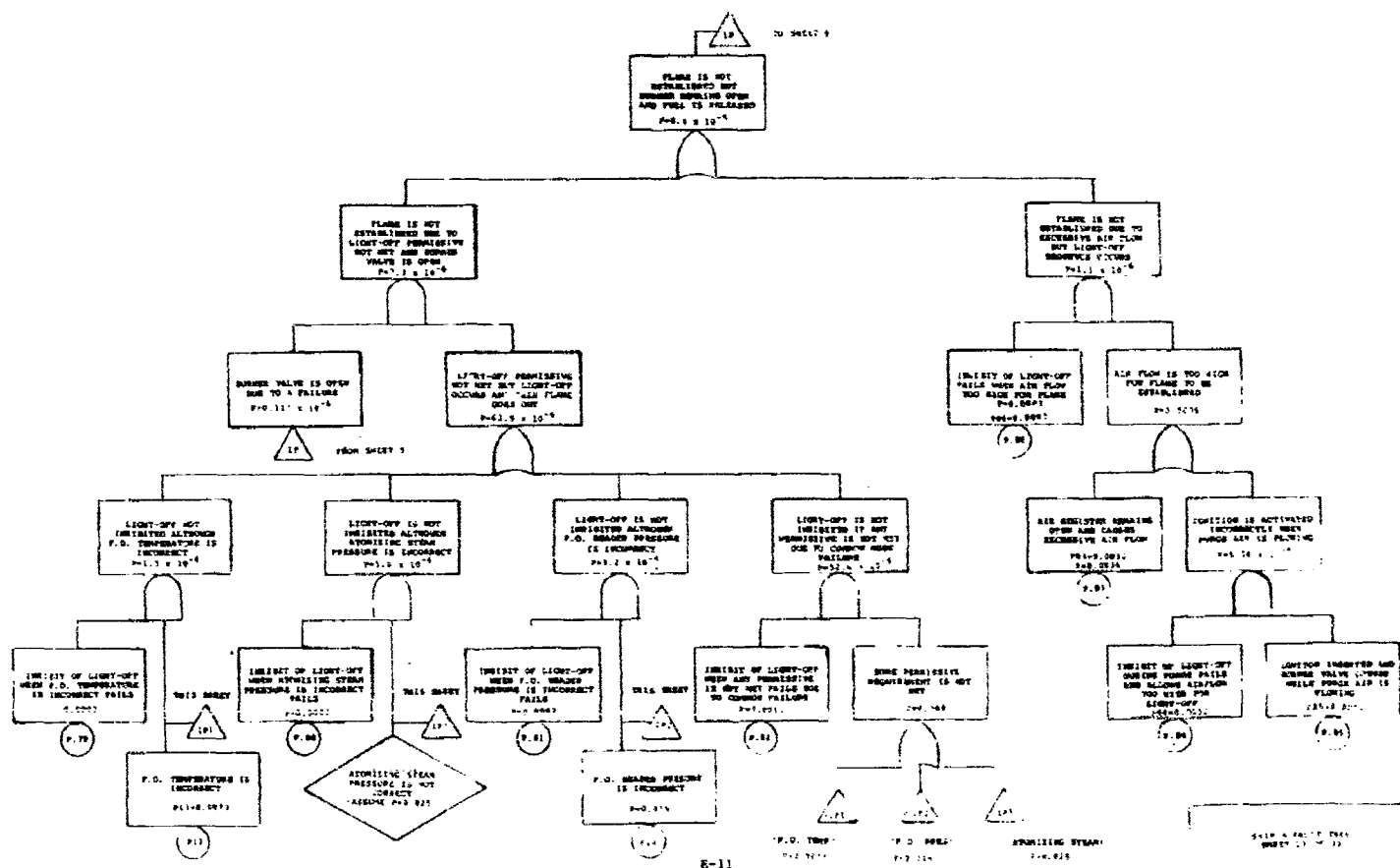


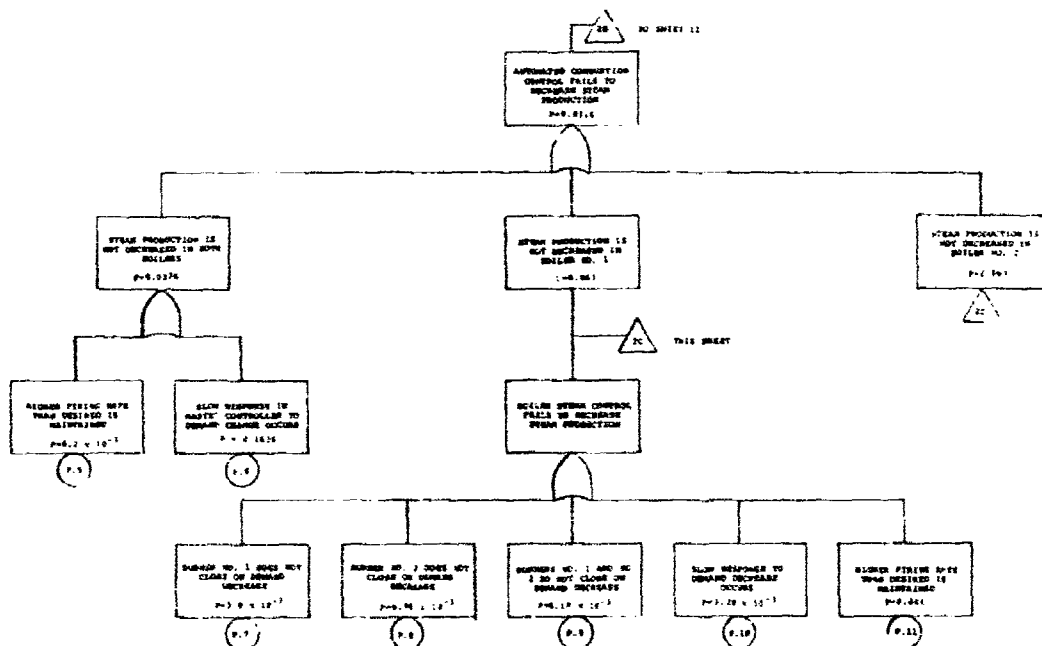


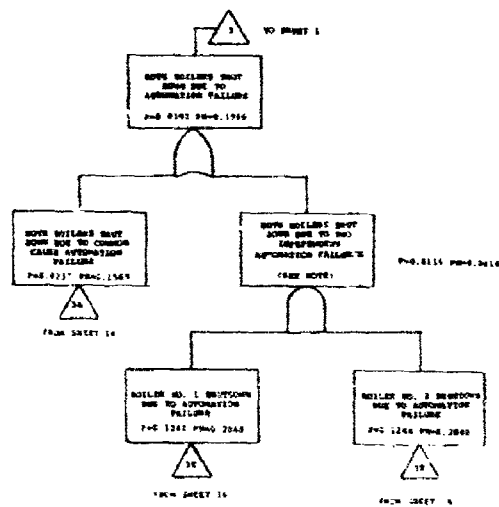


W. J. VALEY PREP
1-17-74

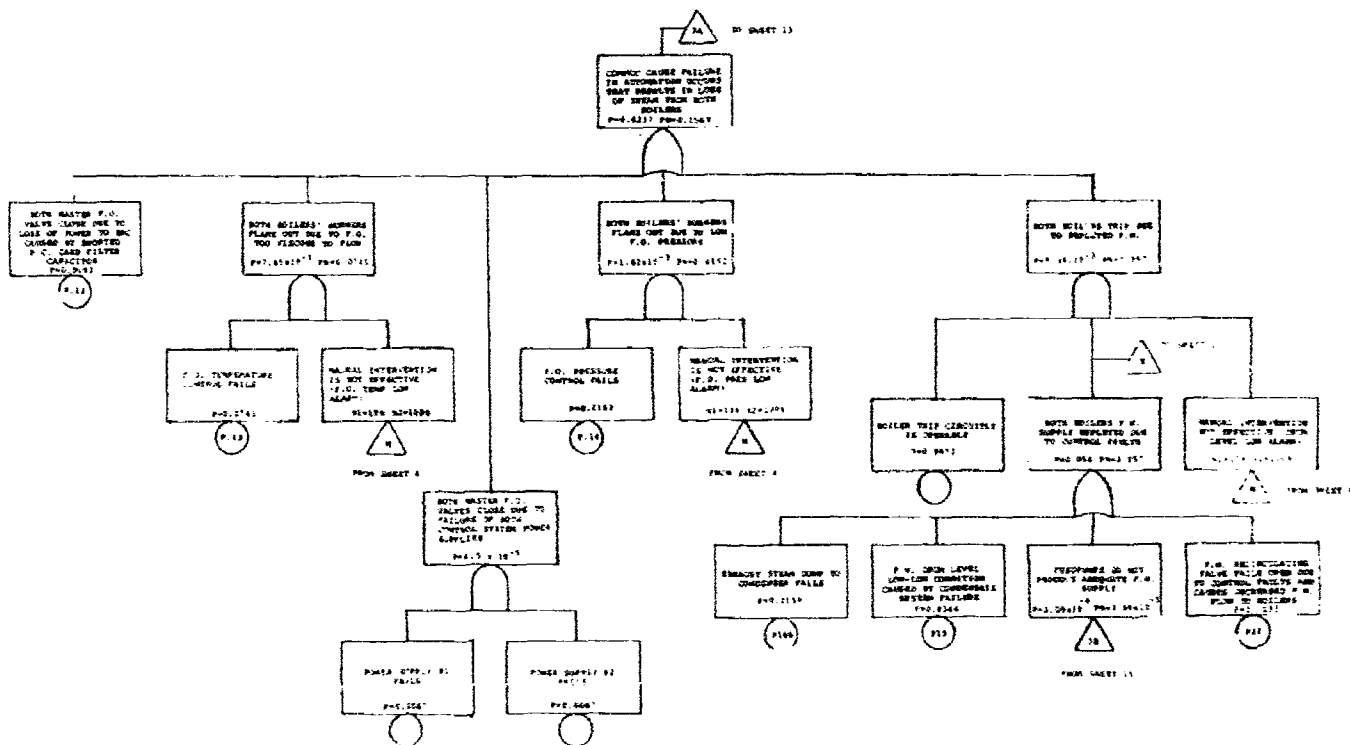




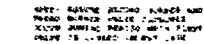


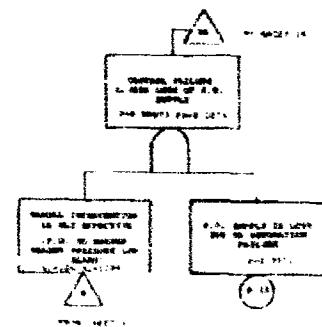
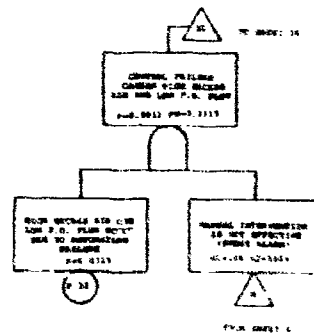
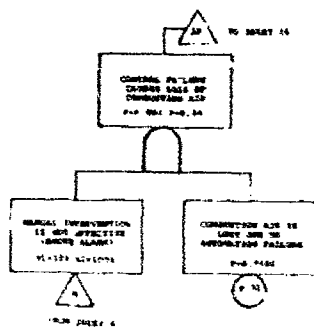


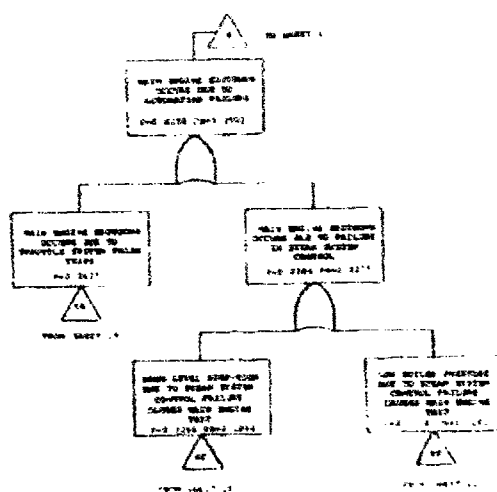
NOTE: ABOVE SECOND BOILER
SHUTDOWN OCCURS DURING PERIOD
OF FIRST BOILER SHUTDOWN
(MAYBE, 1956)





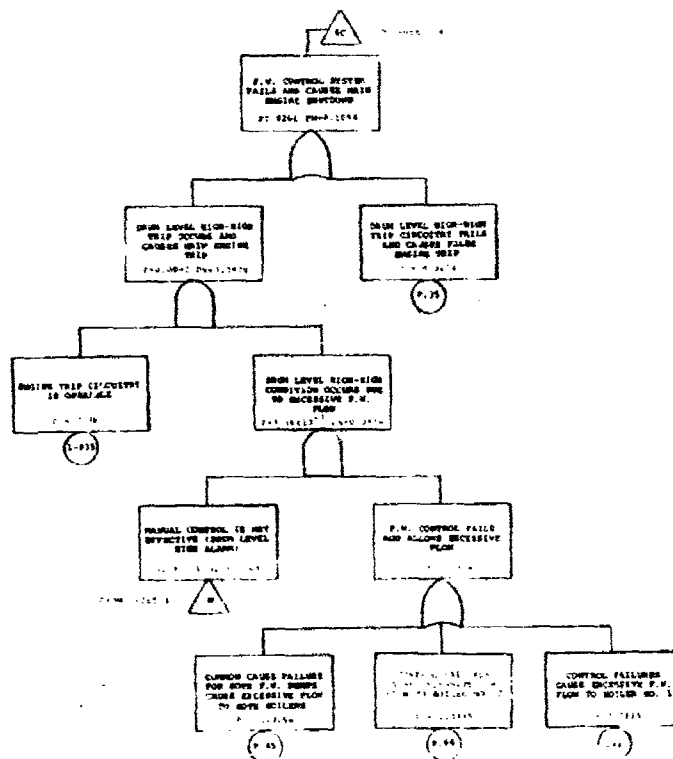


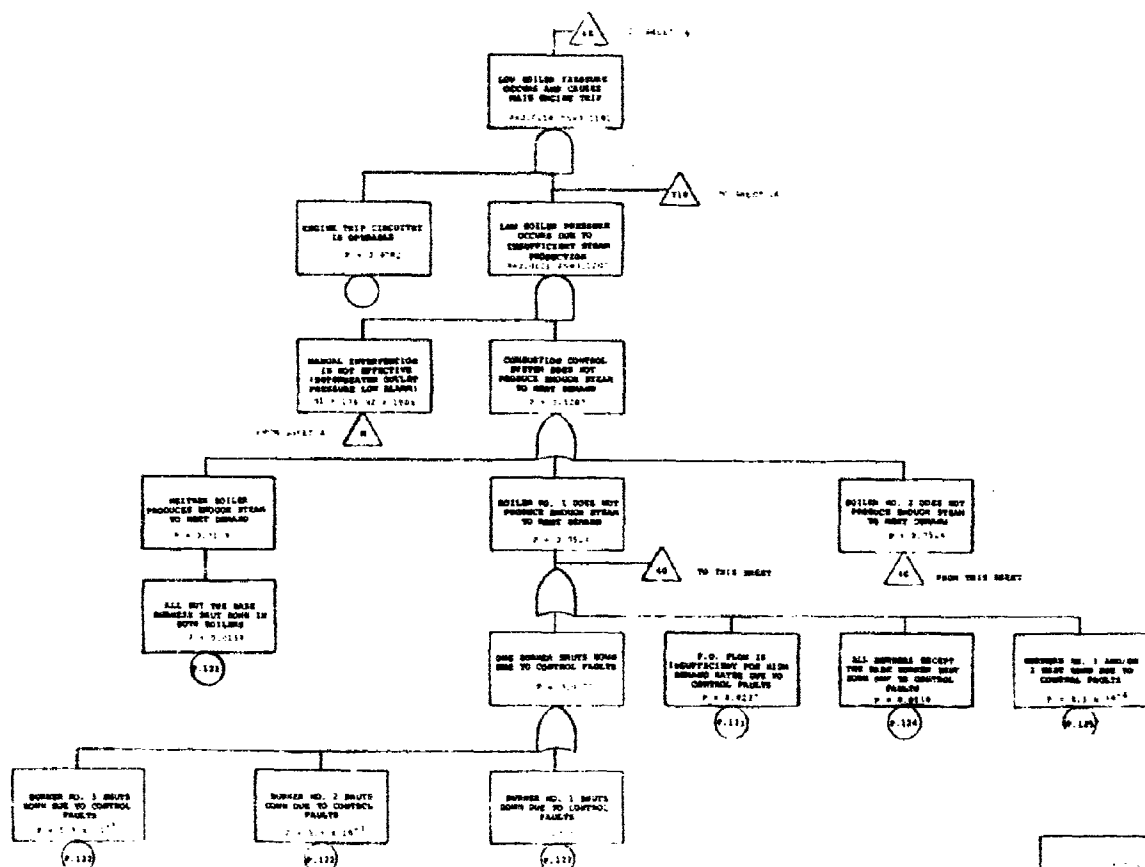


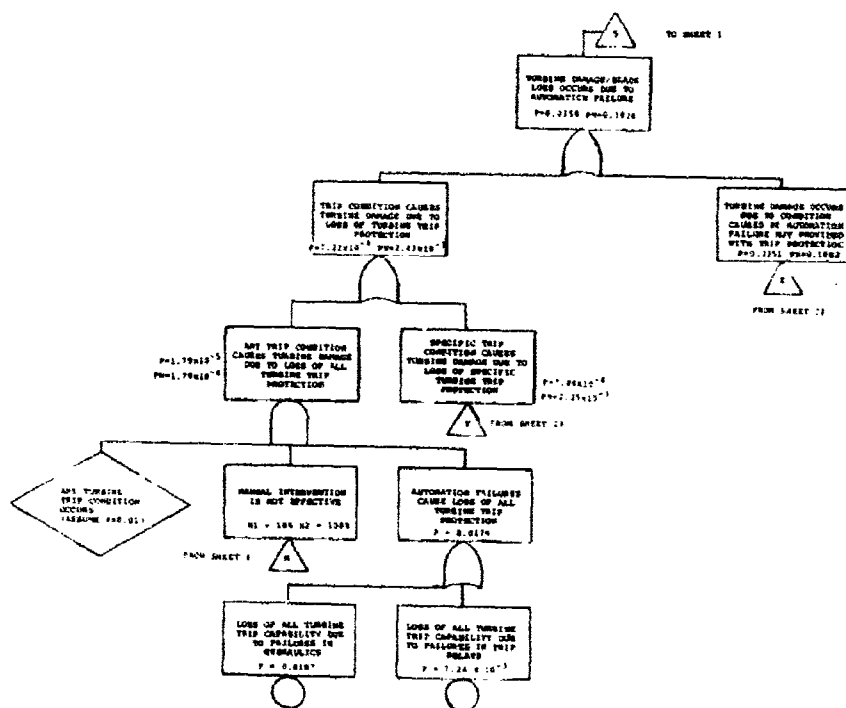


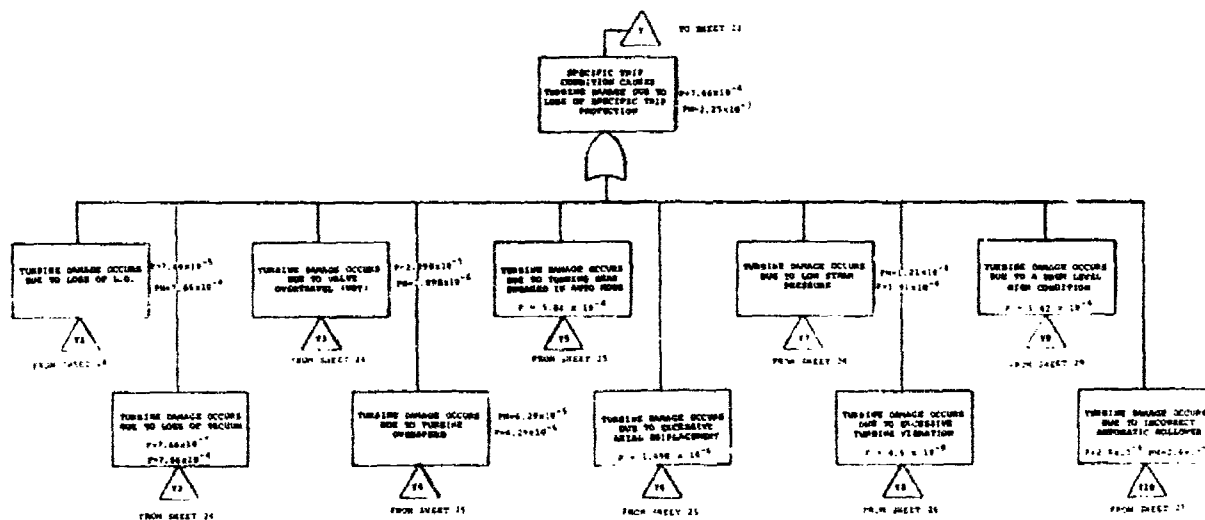


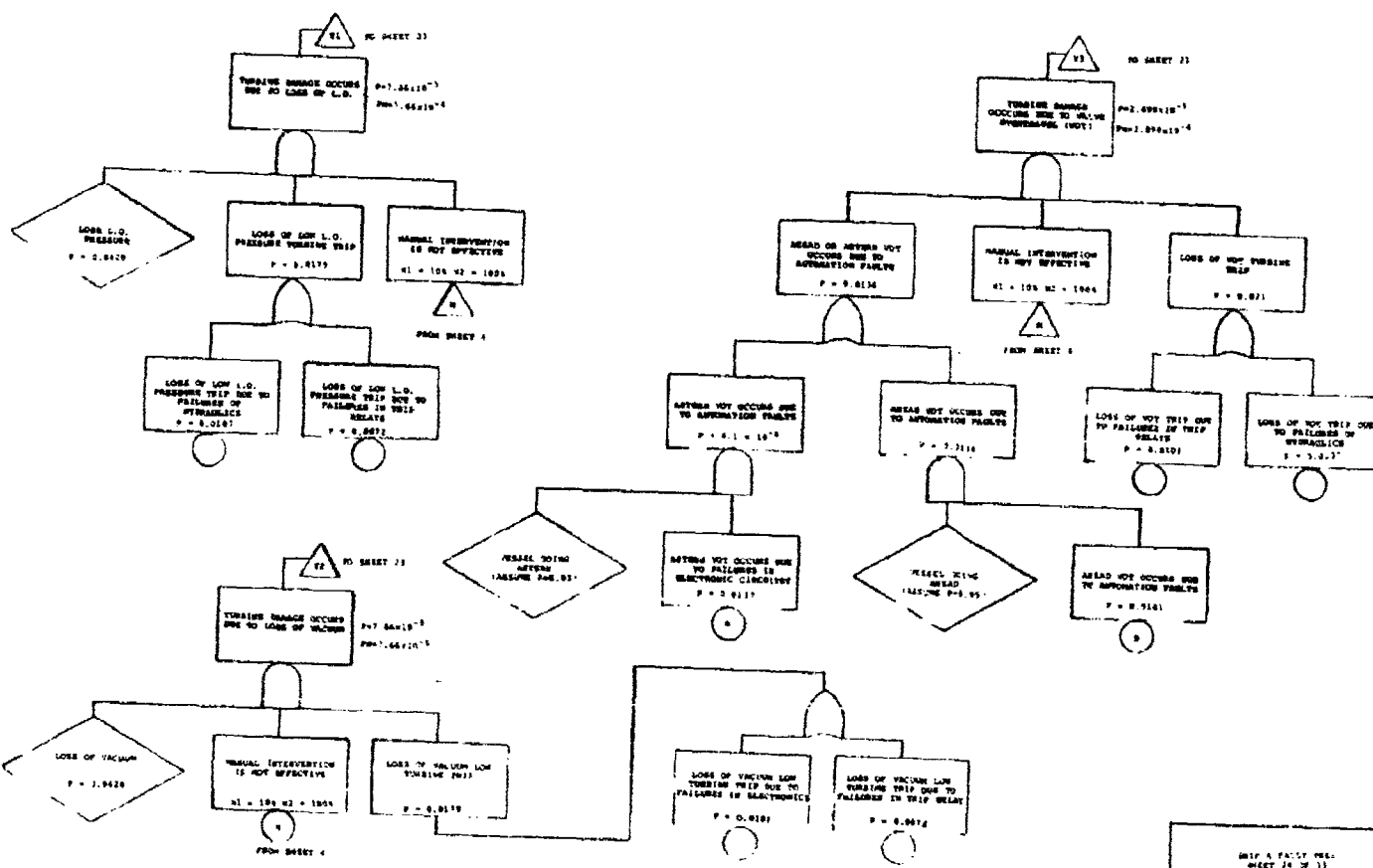
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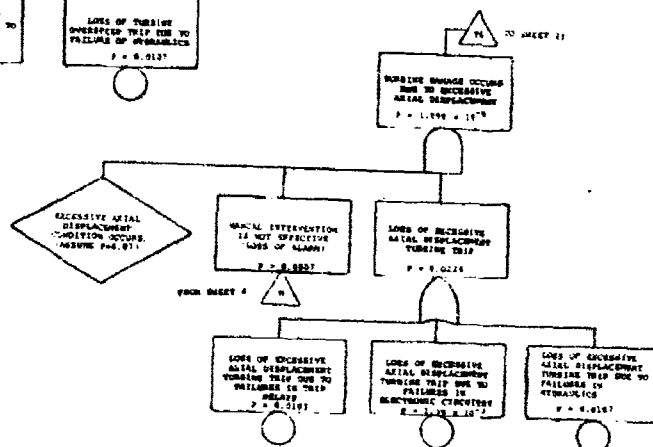
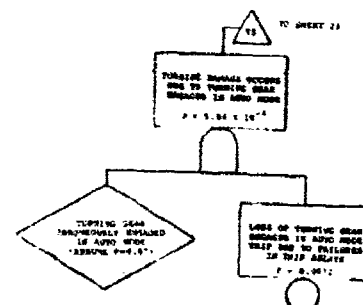
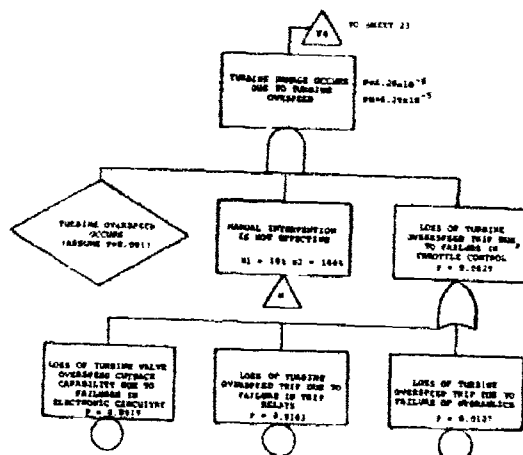


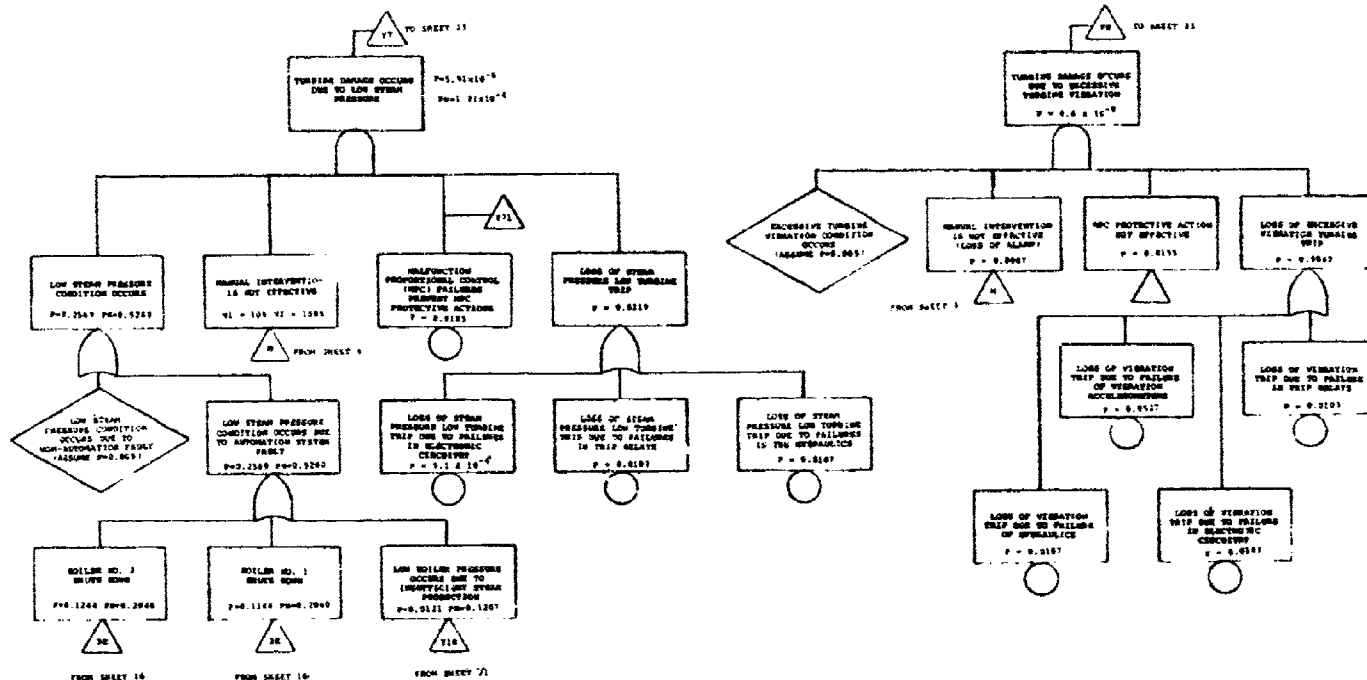


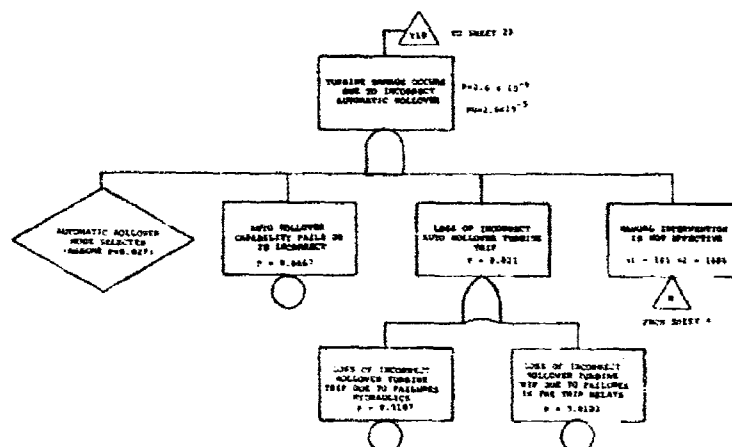


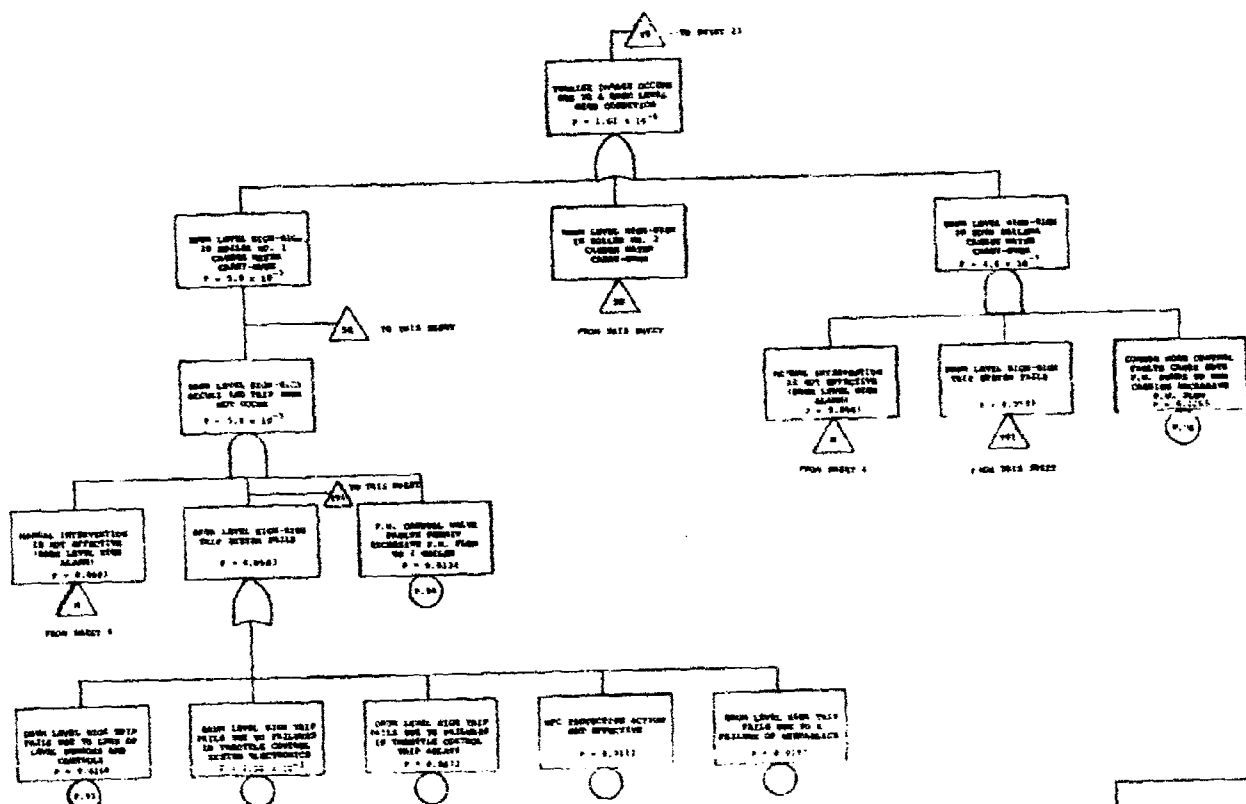










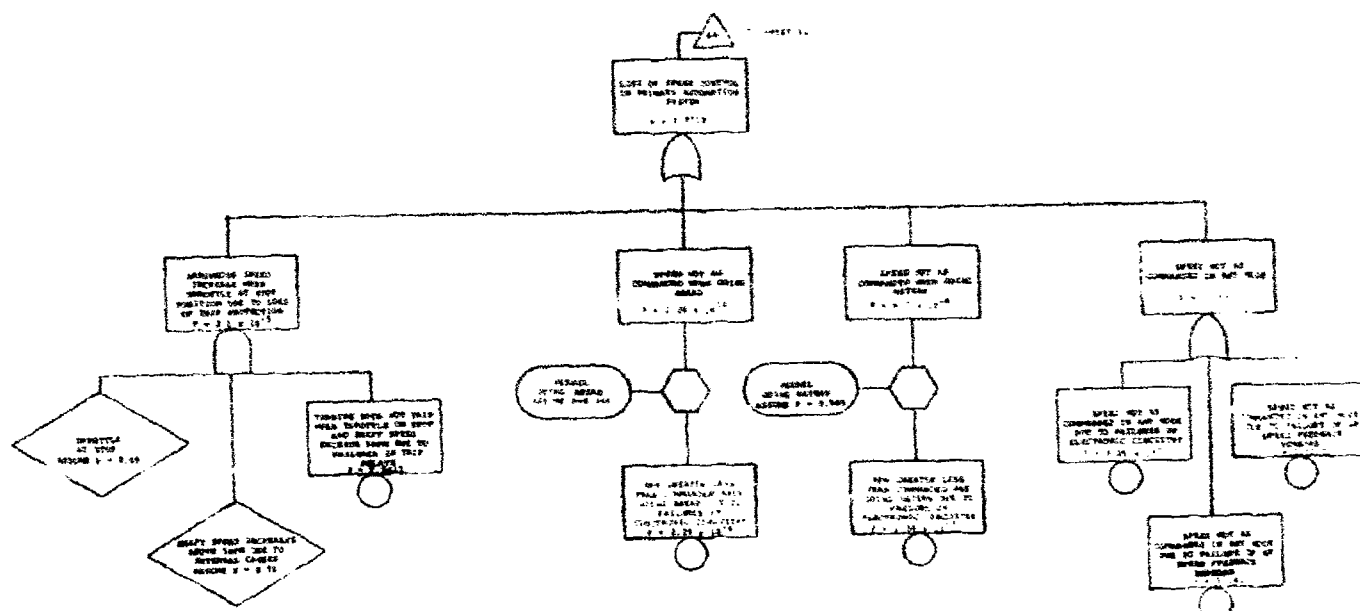




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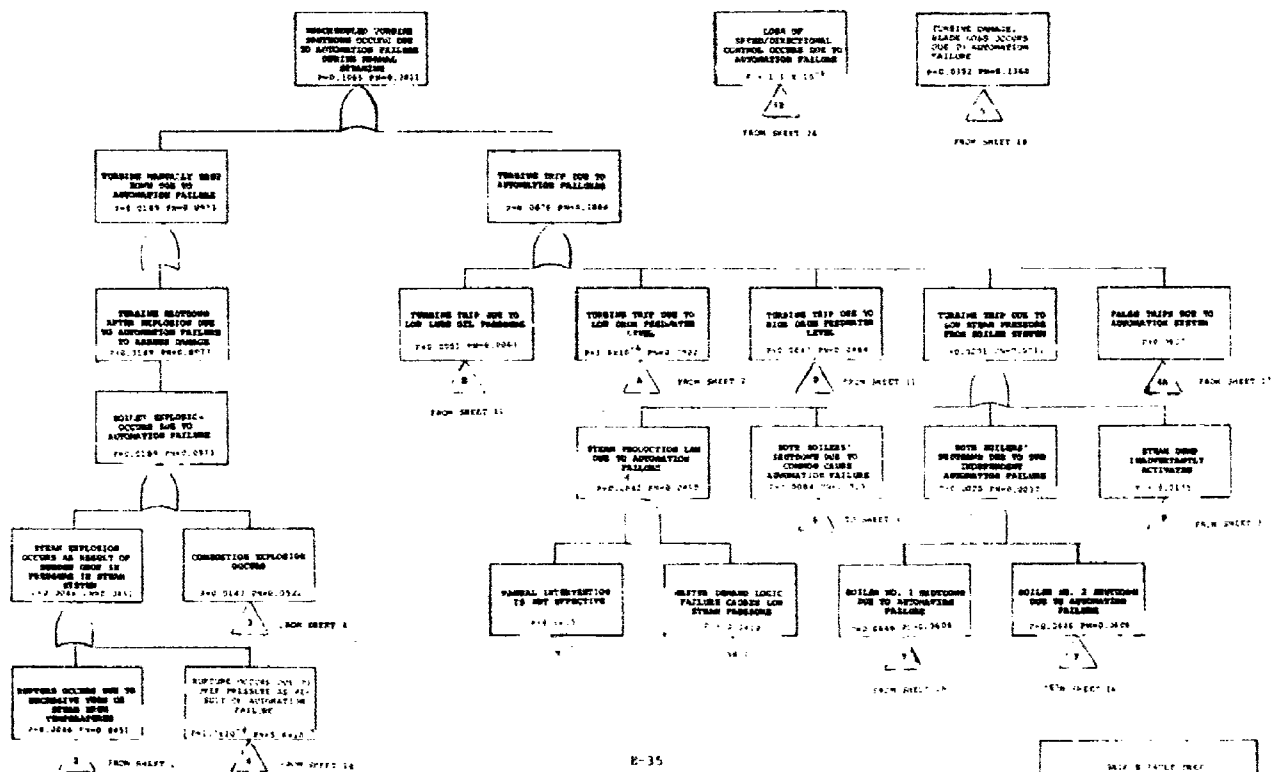


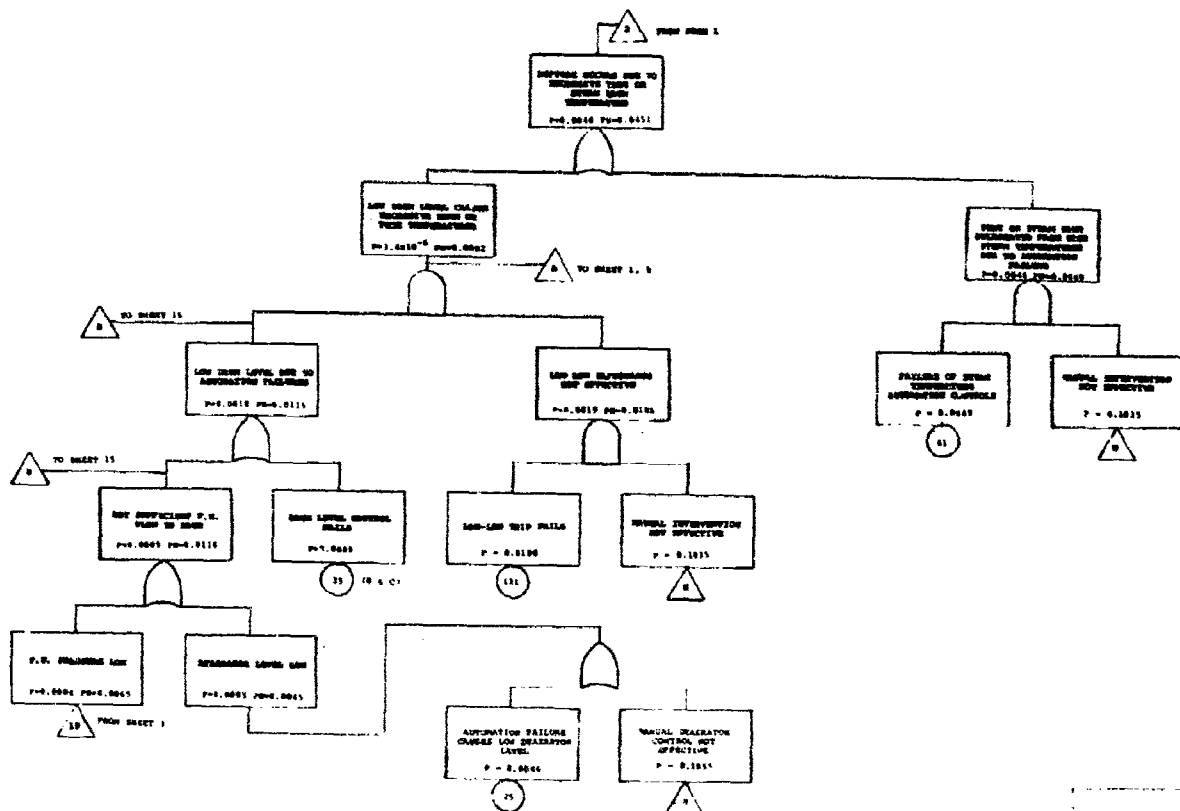
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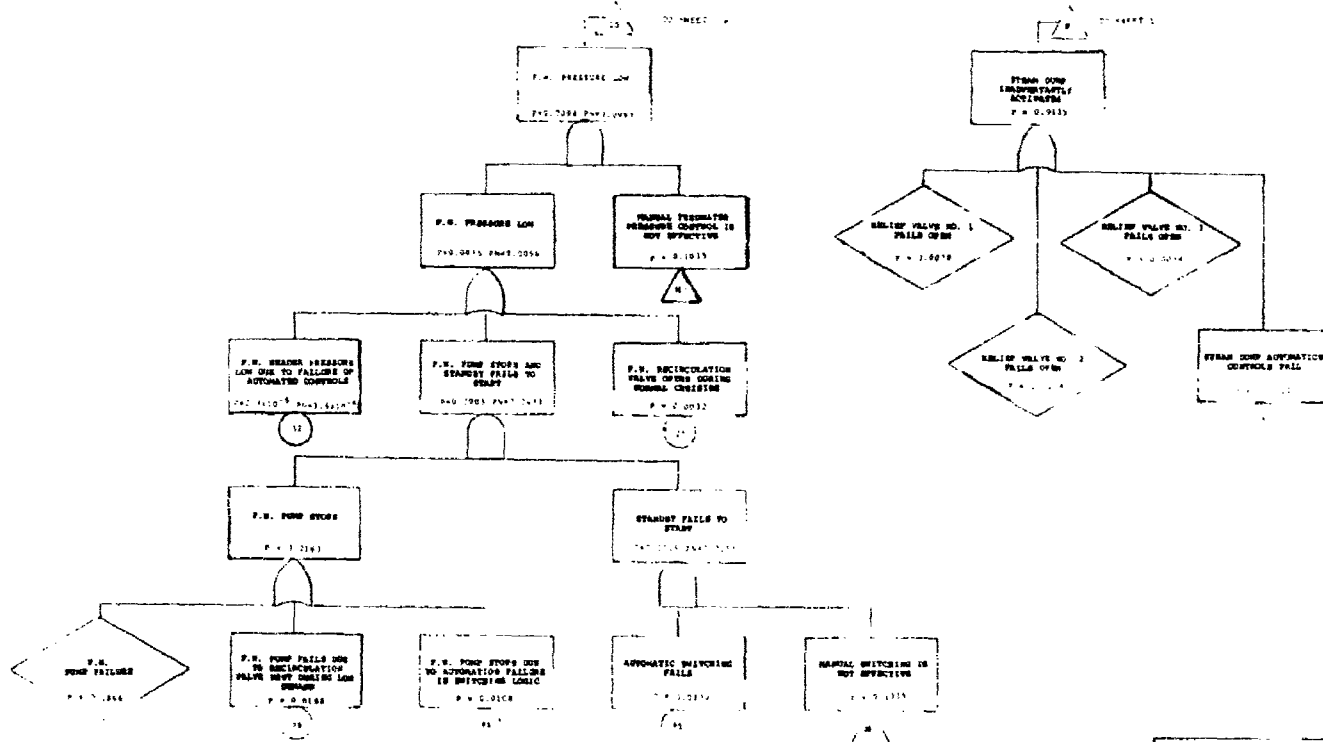


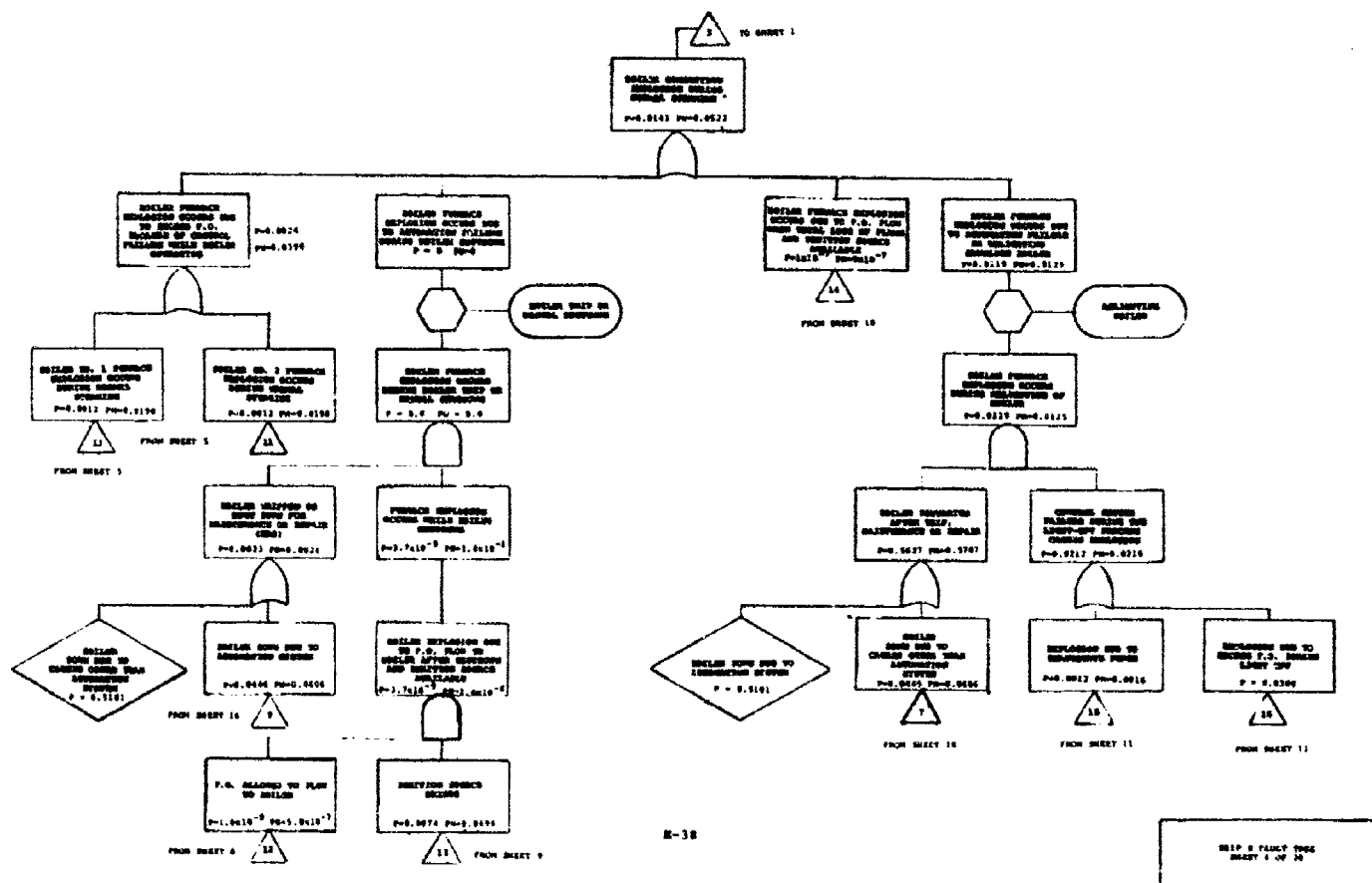


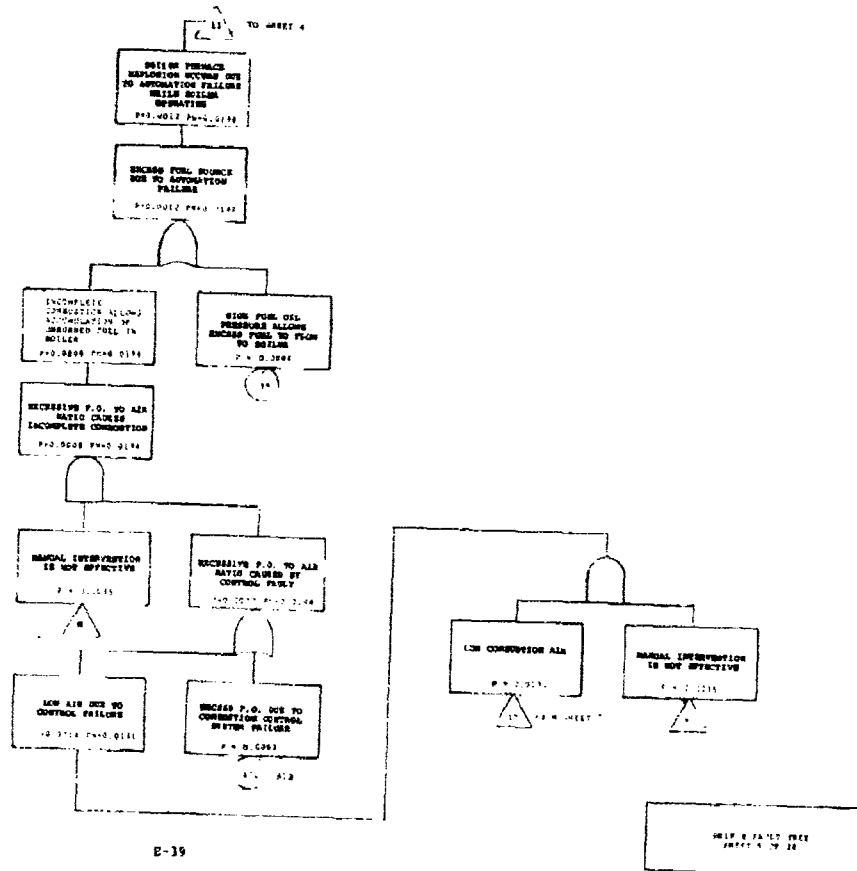
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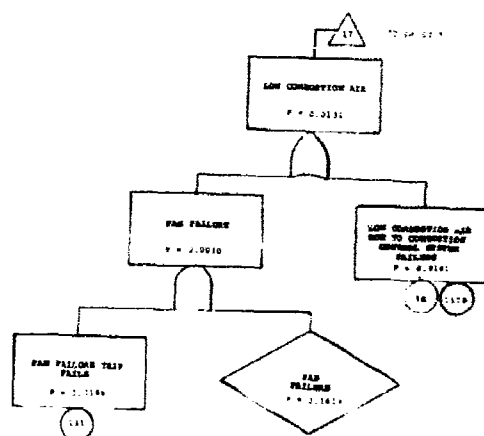






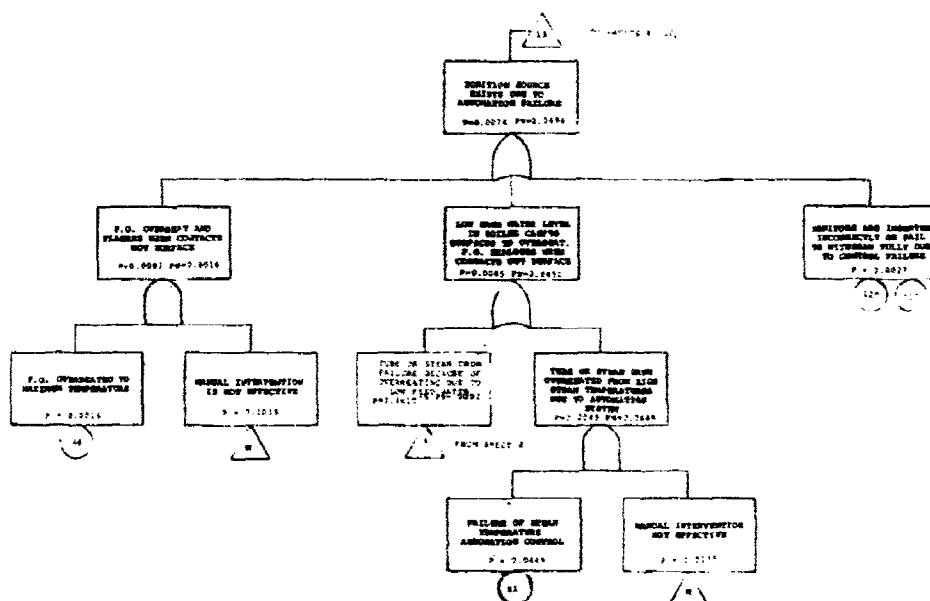


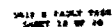


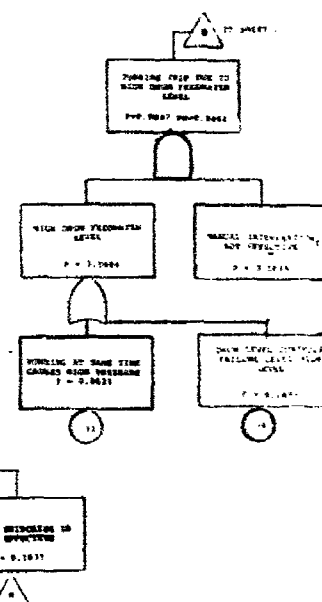
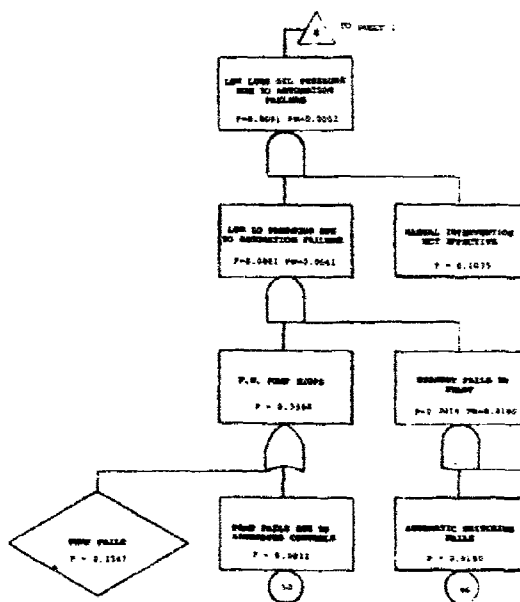
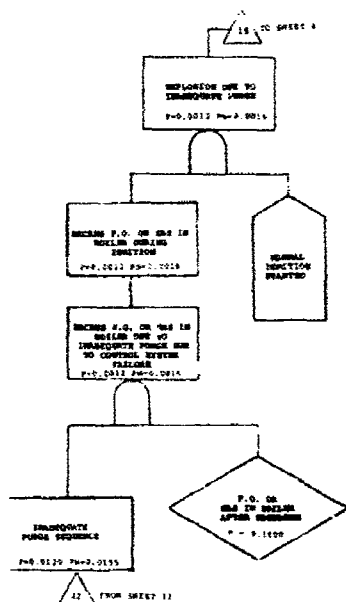




1950 年 6 月 22 日 星期一
1950 年 6 月 23 日 星期二

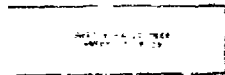


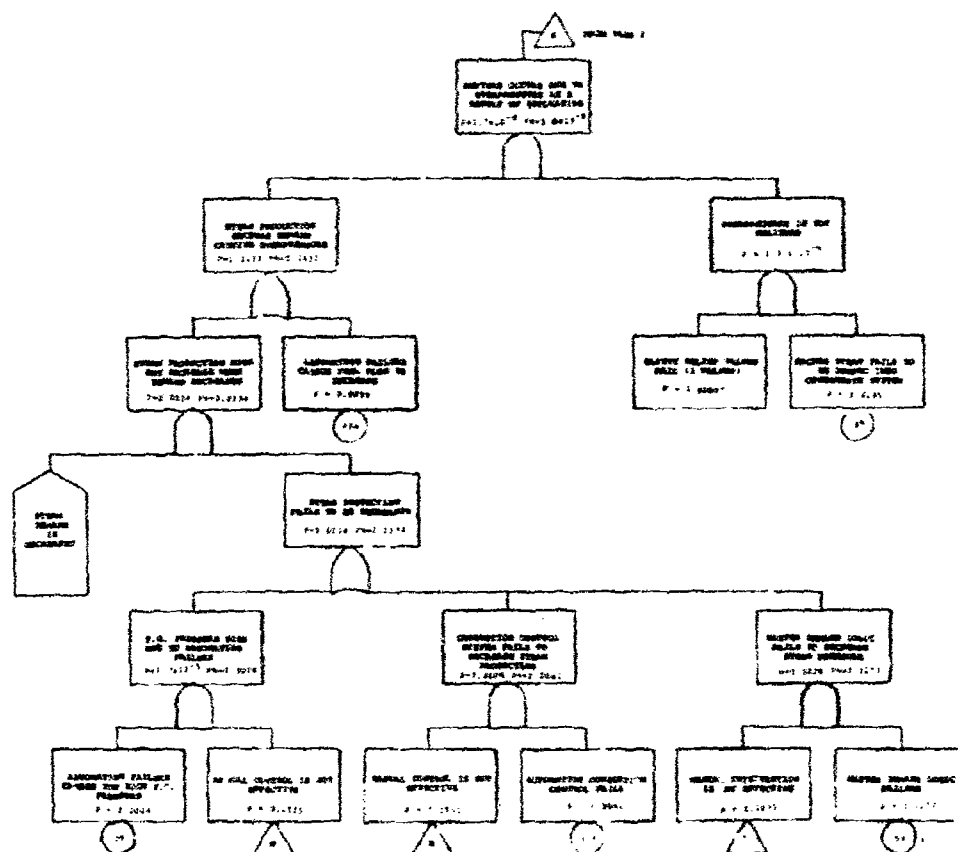


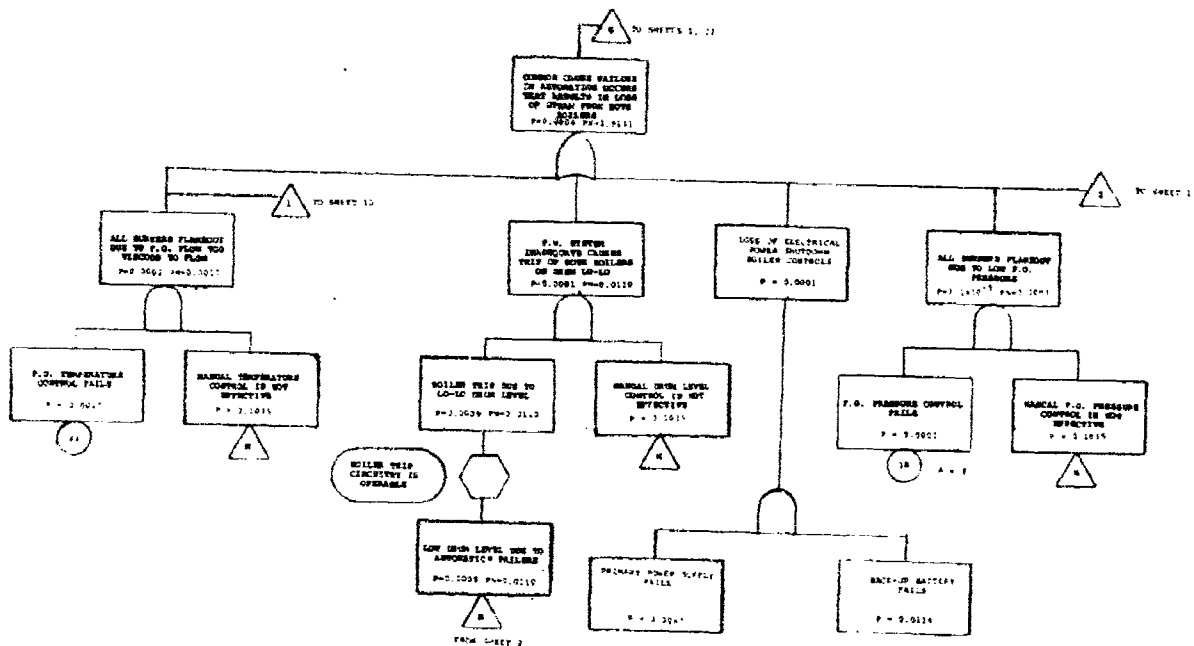


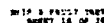


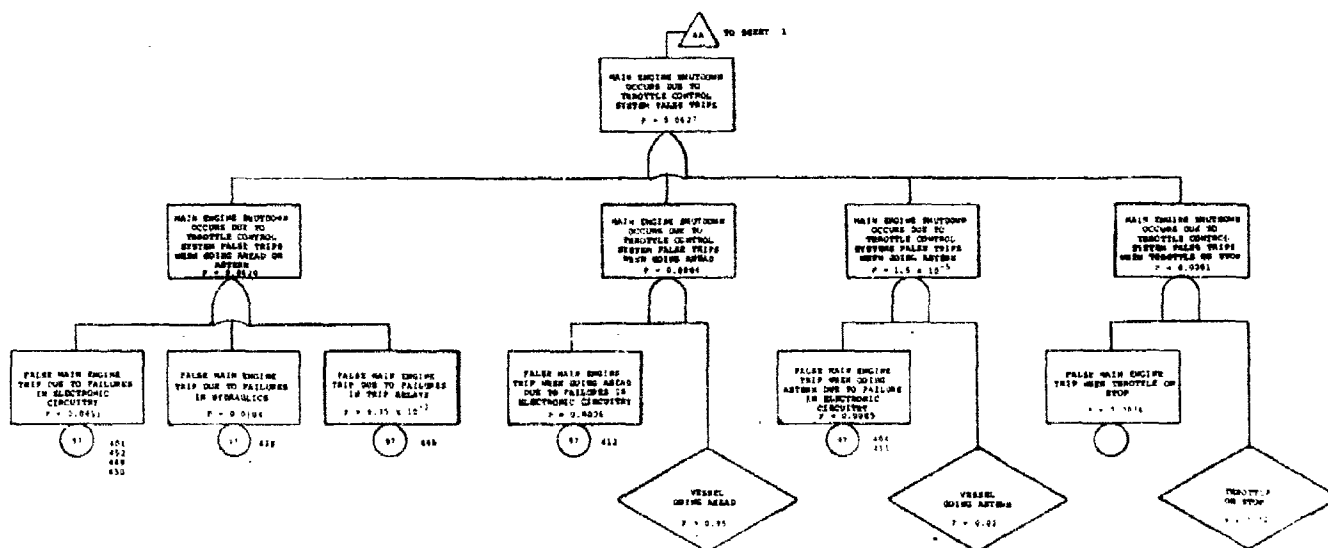
DATE 10/24/2001
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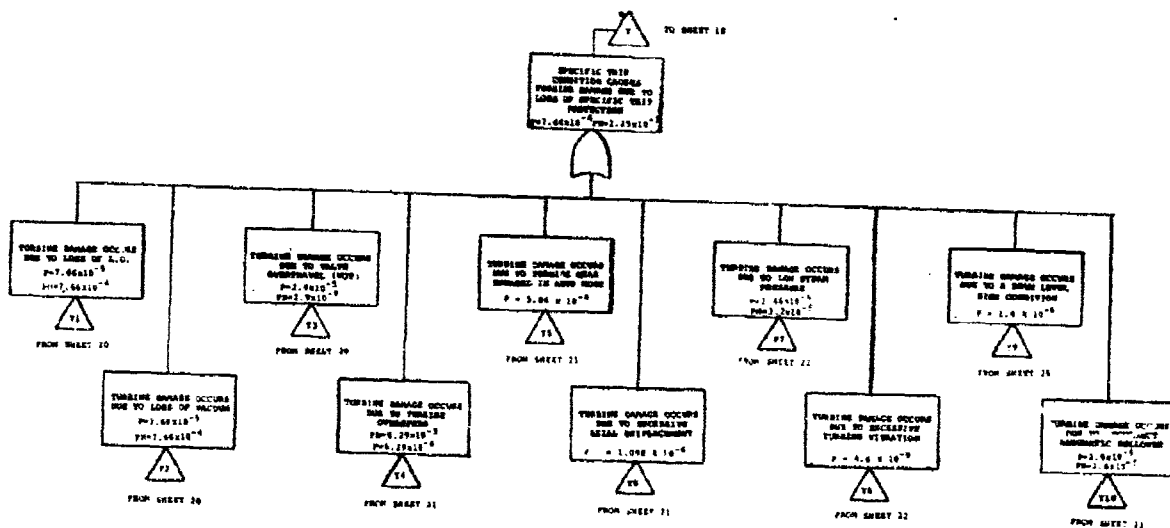


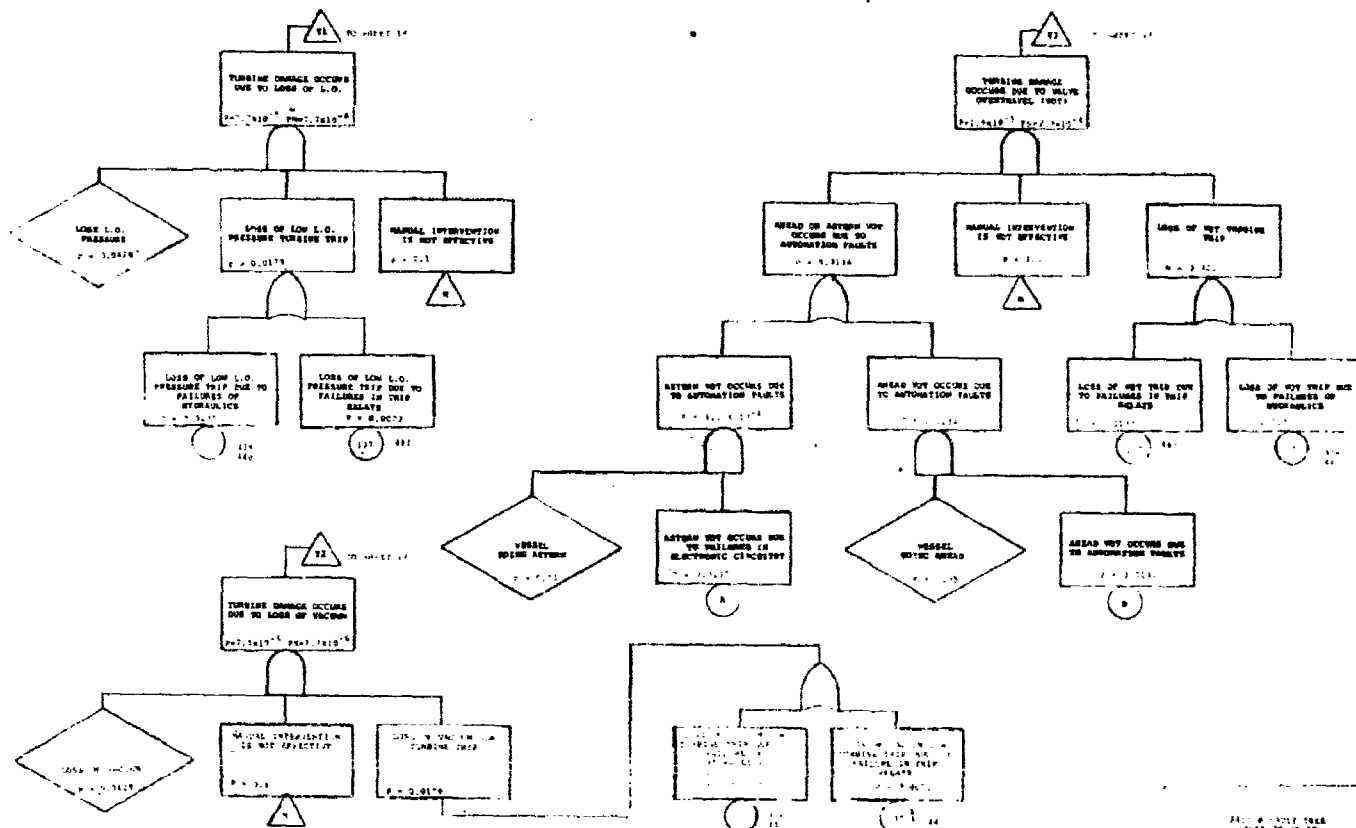


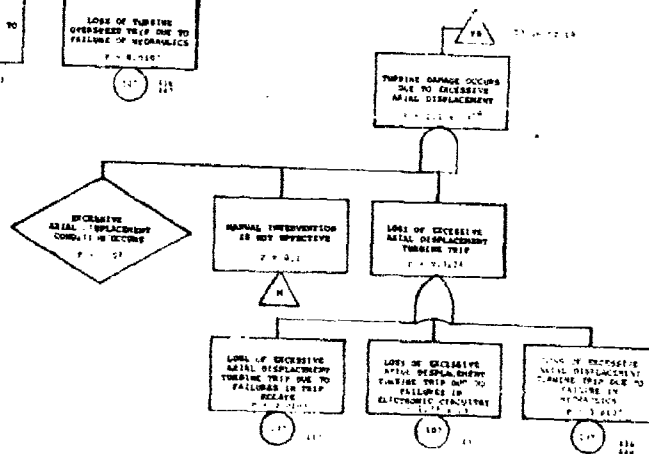
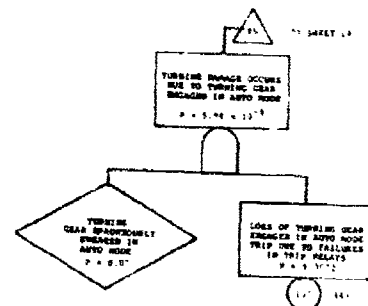


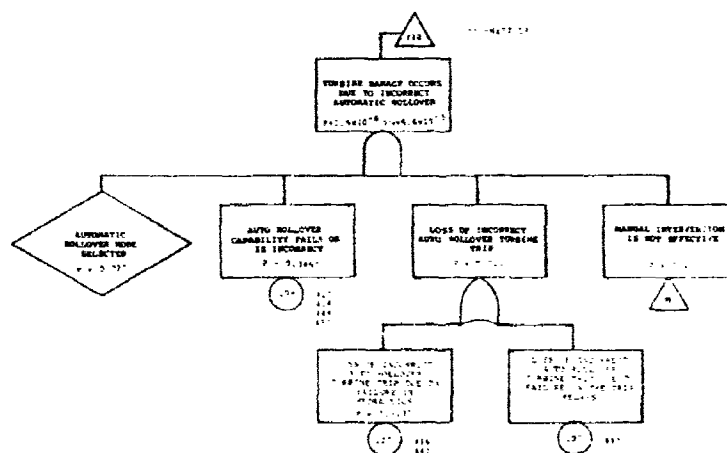


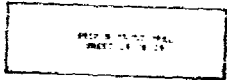


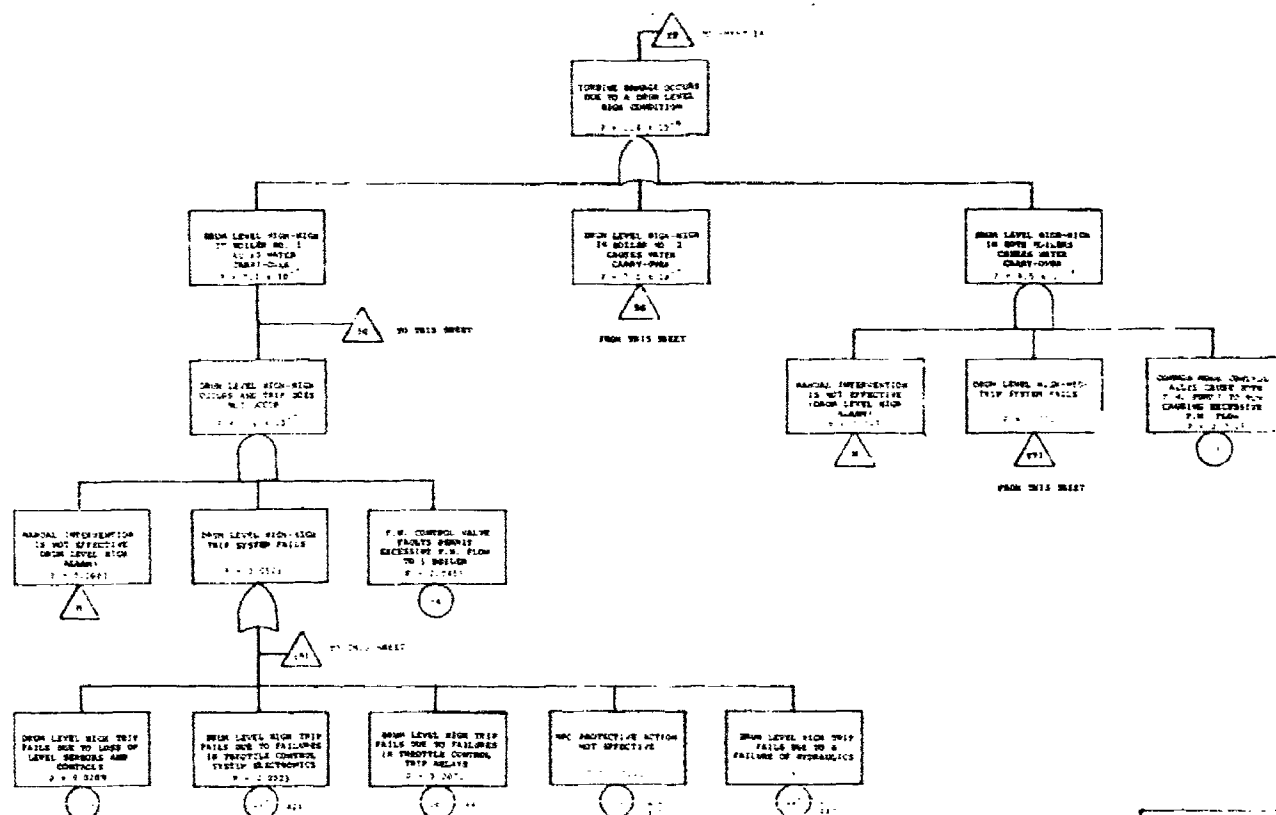




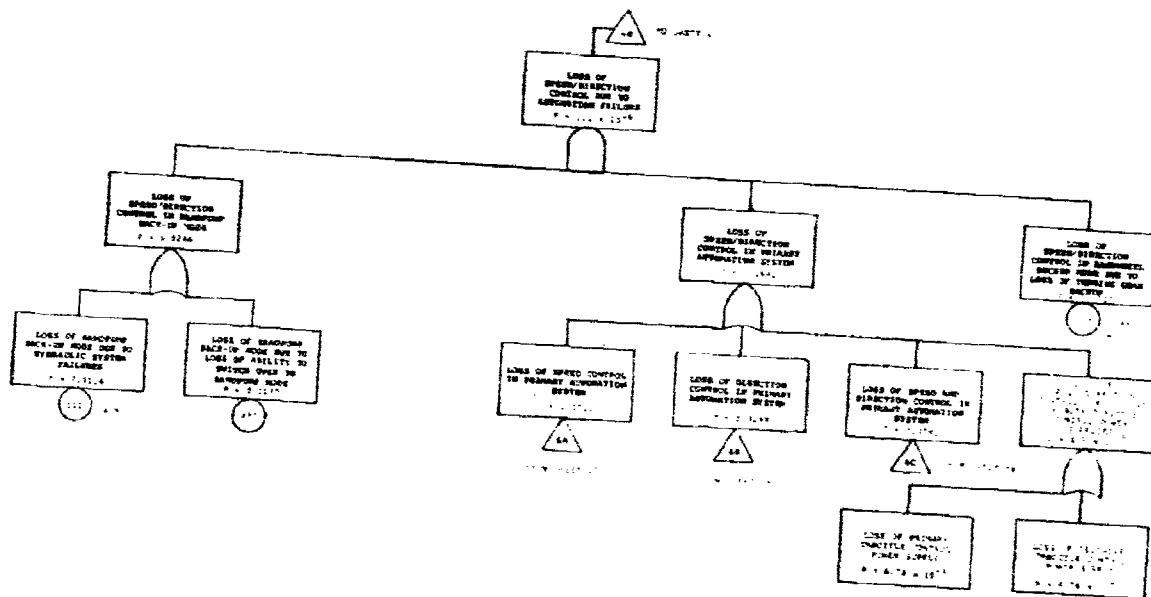


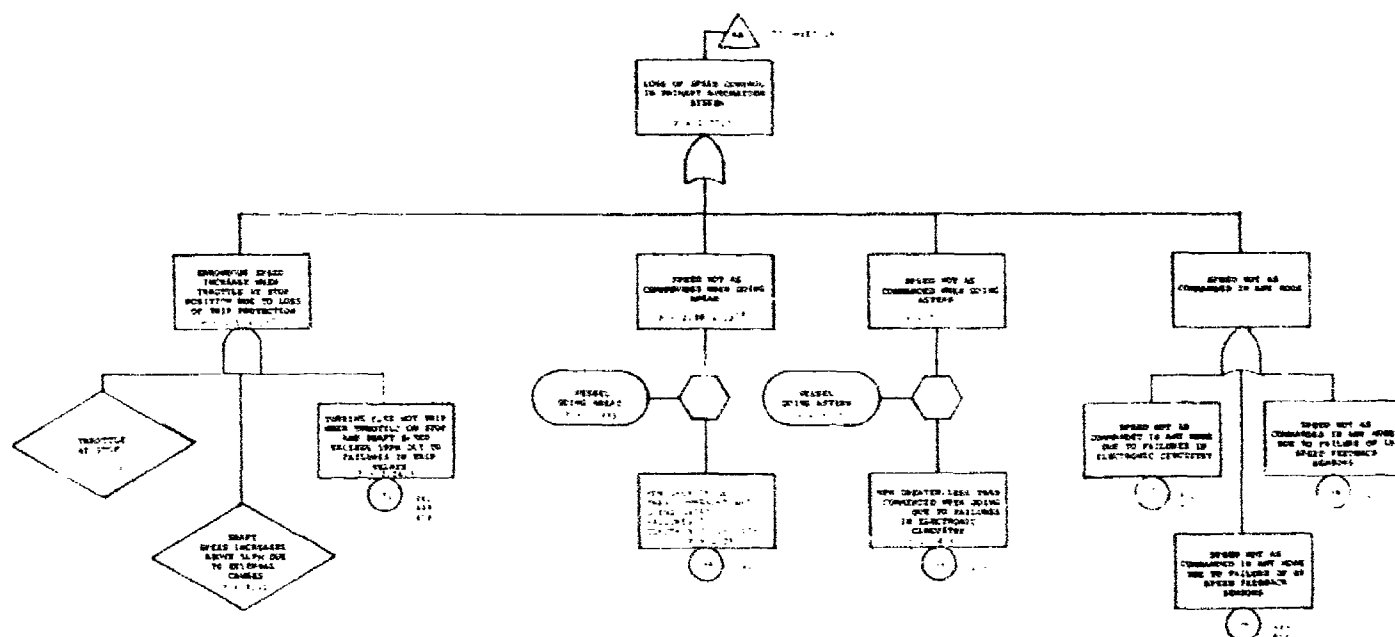


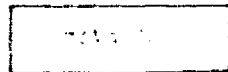


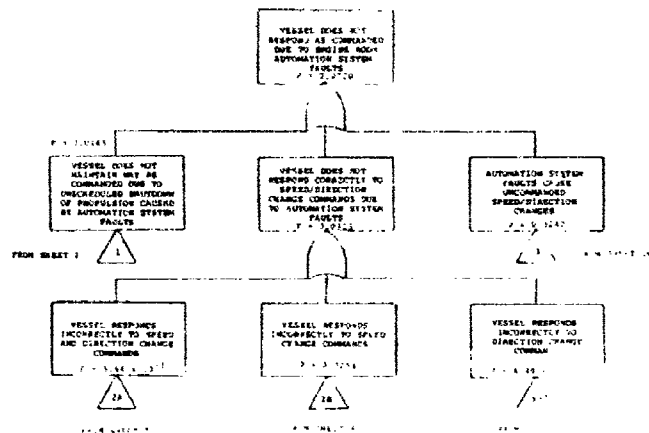


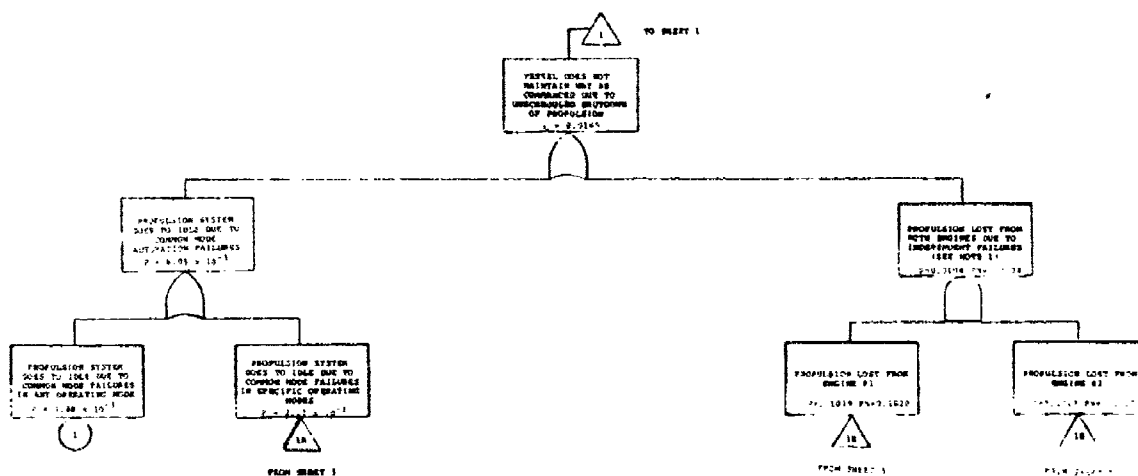
NOT A TABLE
TABLE 1.1.1.1



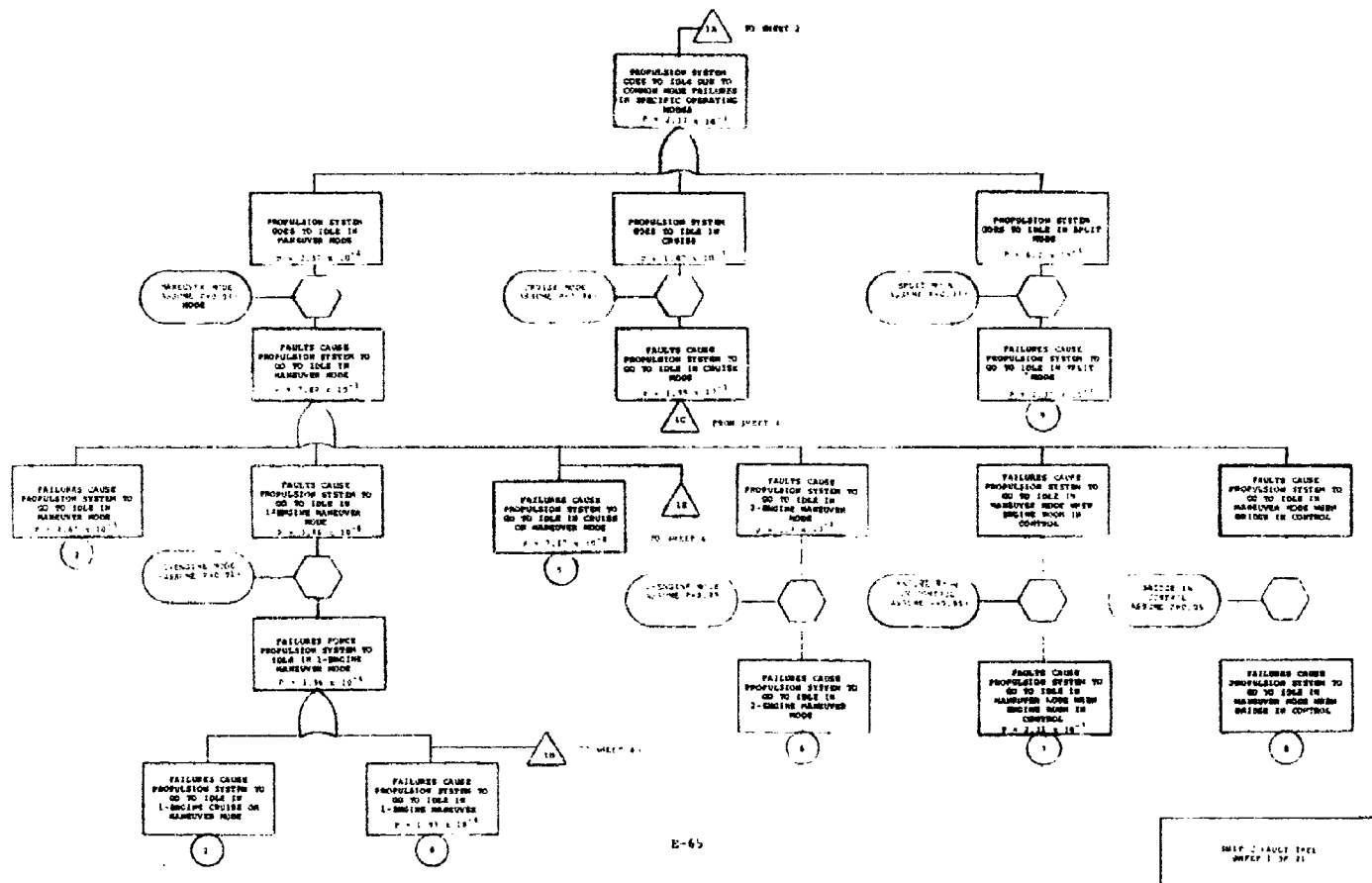


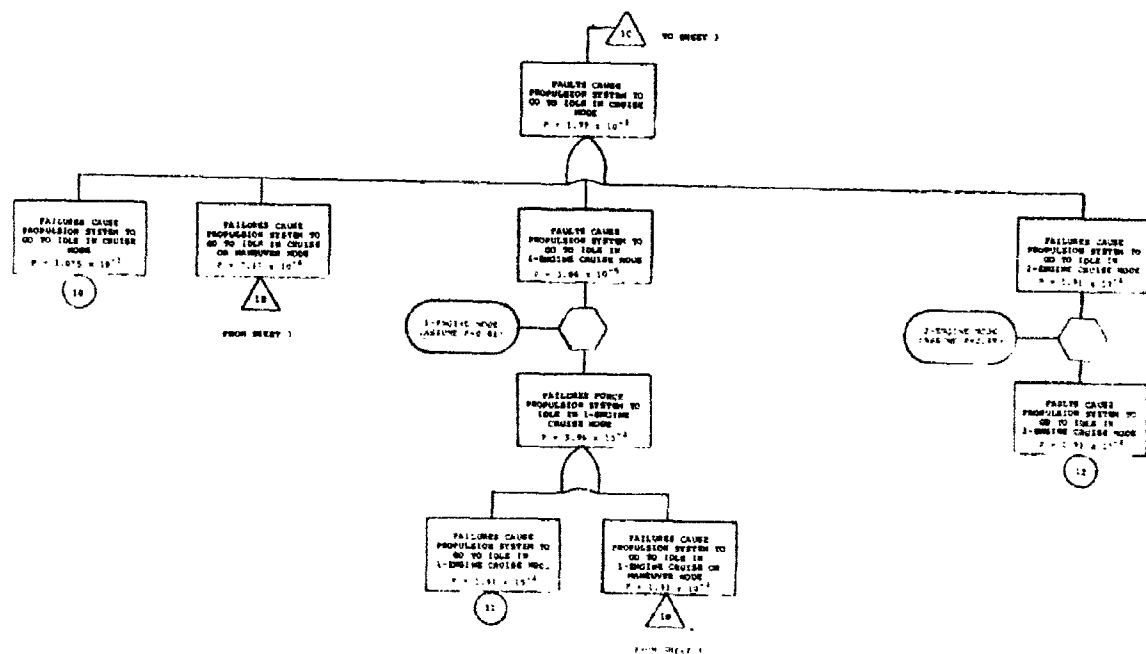


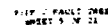


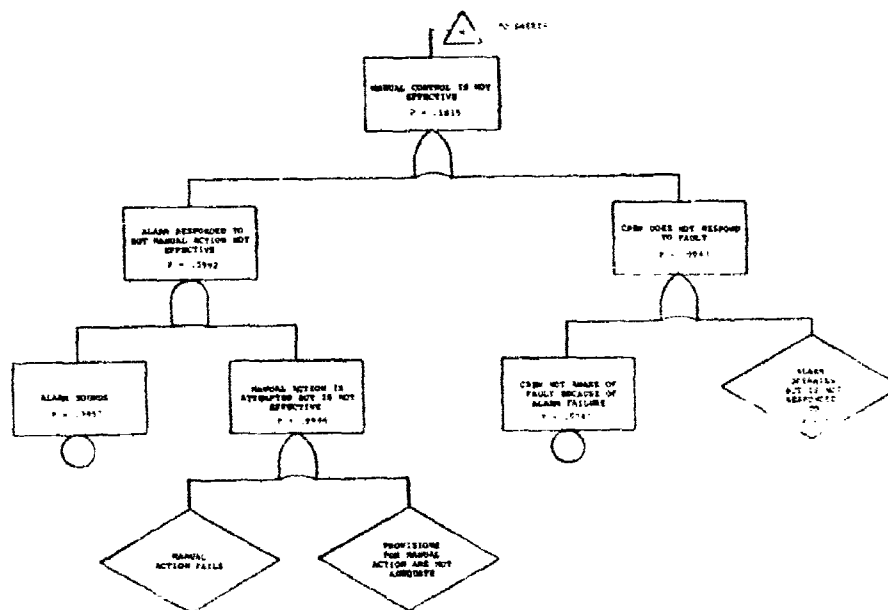


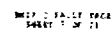
NOTES:
1. ASSUME THAT PROPULSION LOST
FROM SECOND ENGINE DURING
PERIOD WHEN PROPULSION LOST
FROM FIRST ENGINE - WORST CASE.

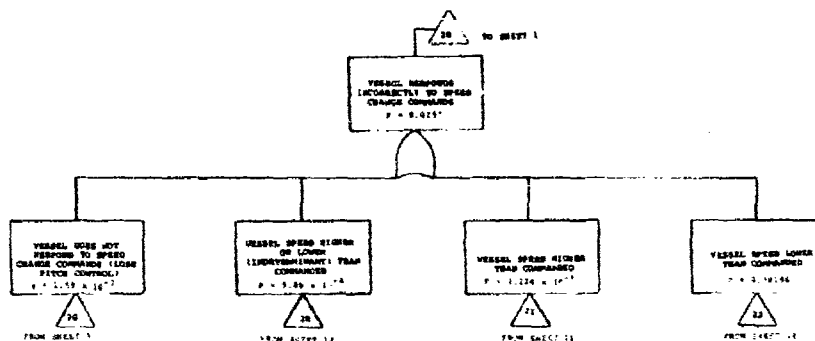


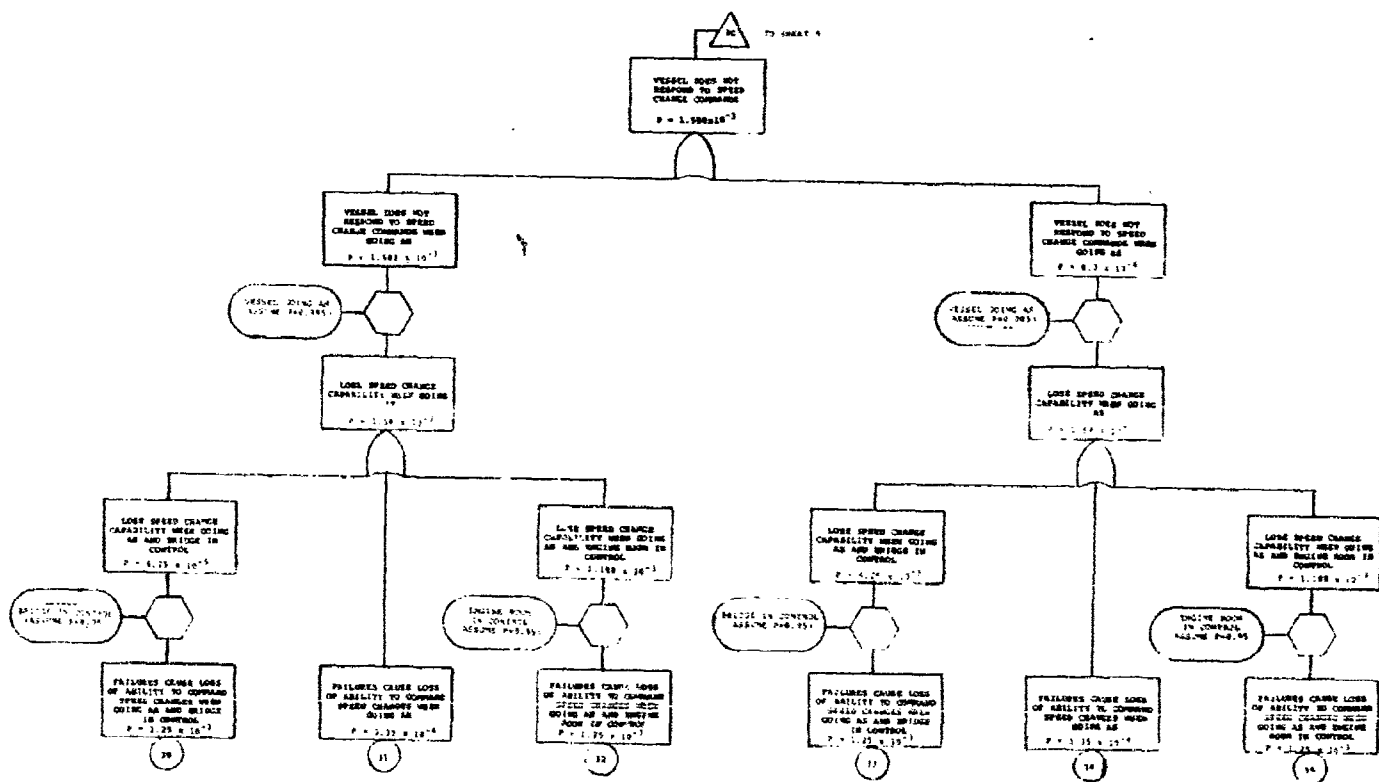


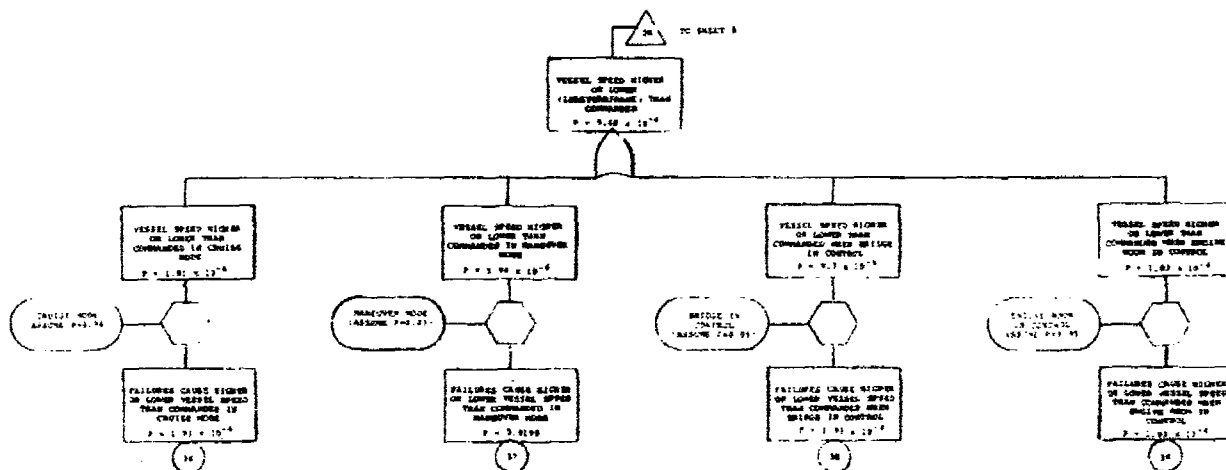


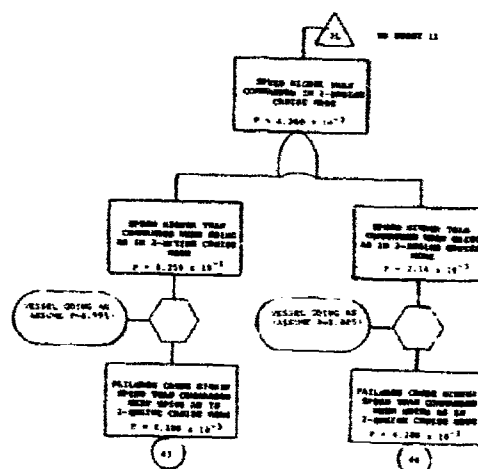
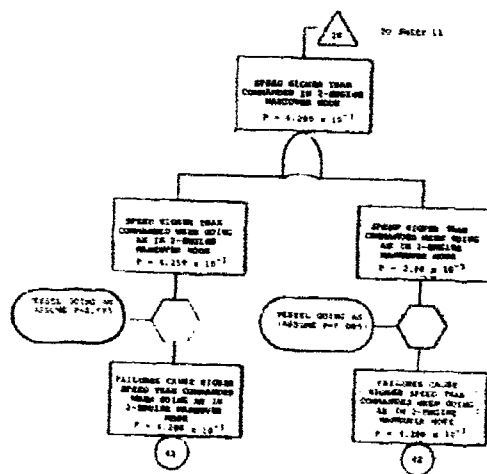


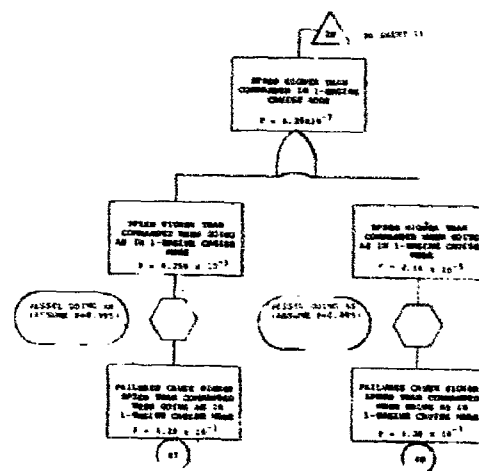
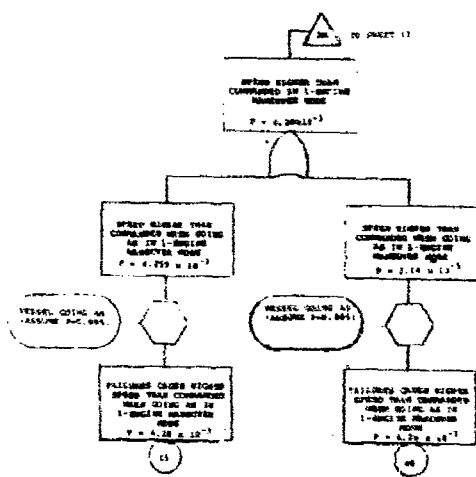


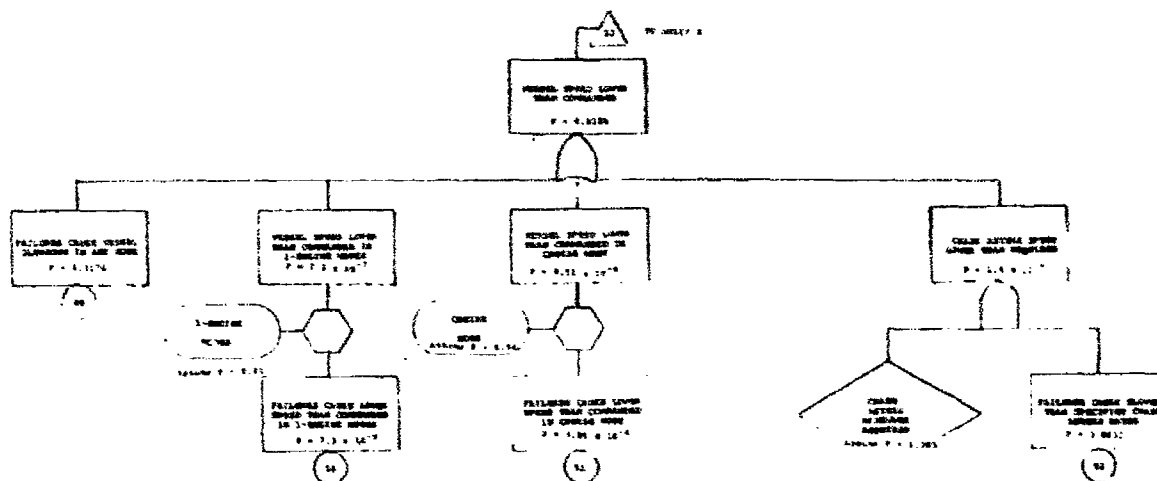


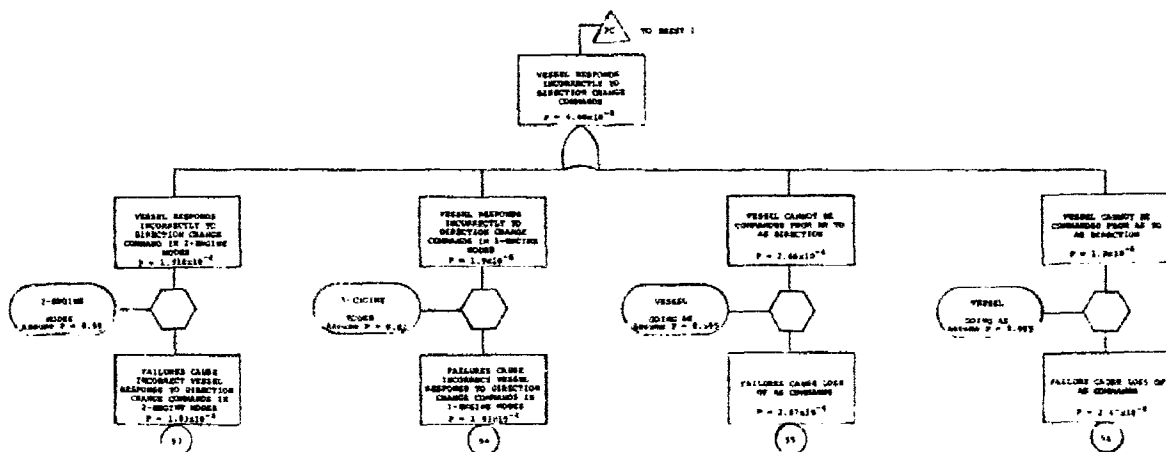


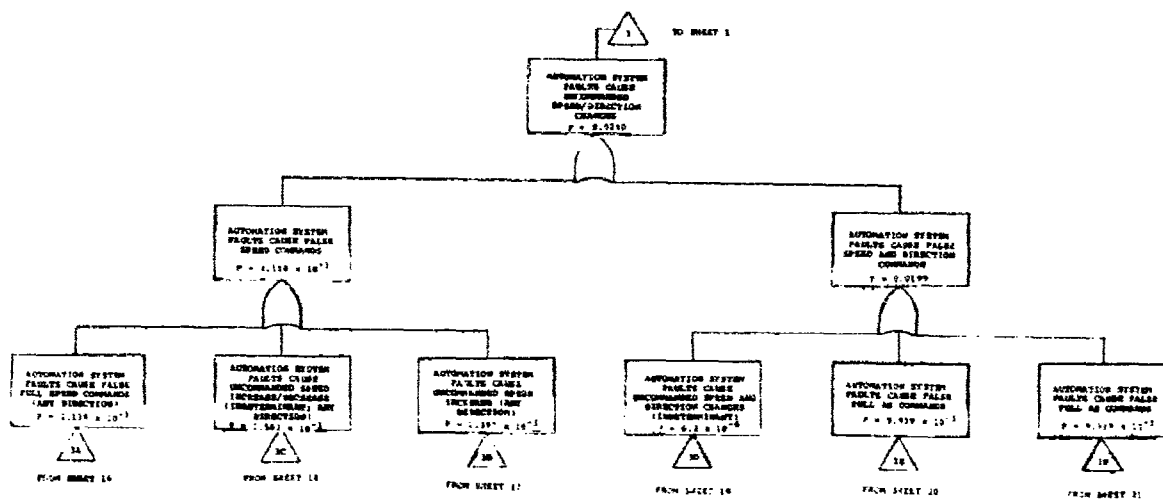


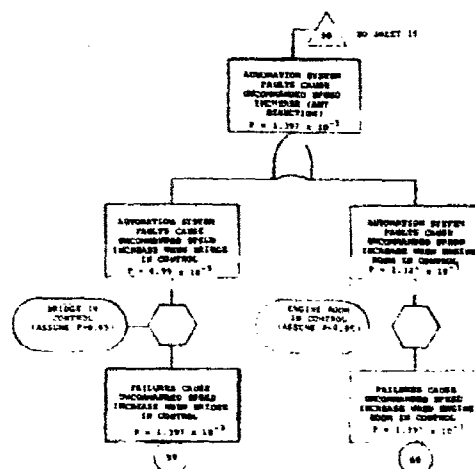
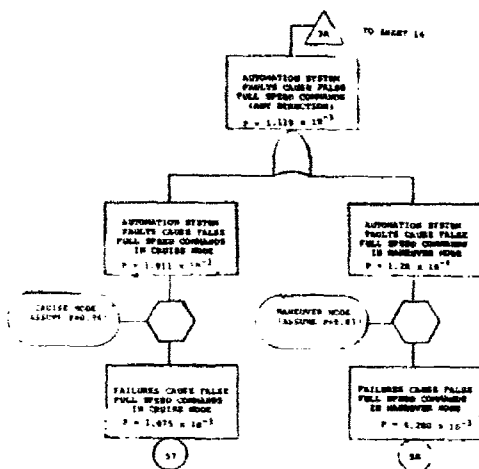


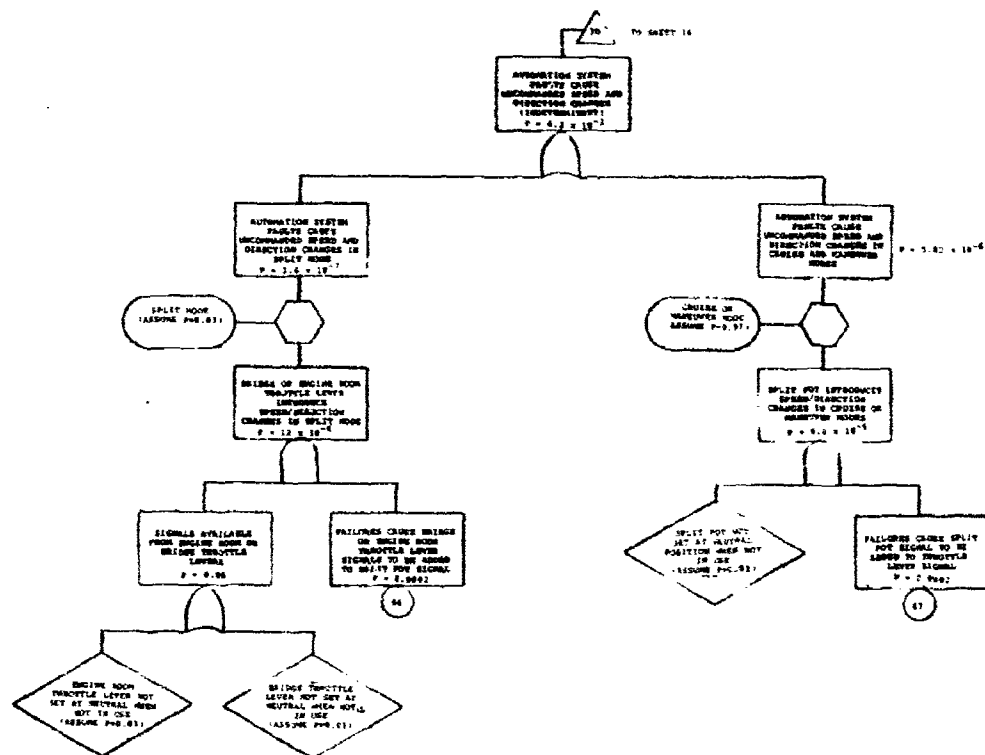


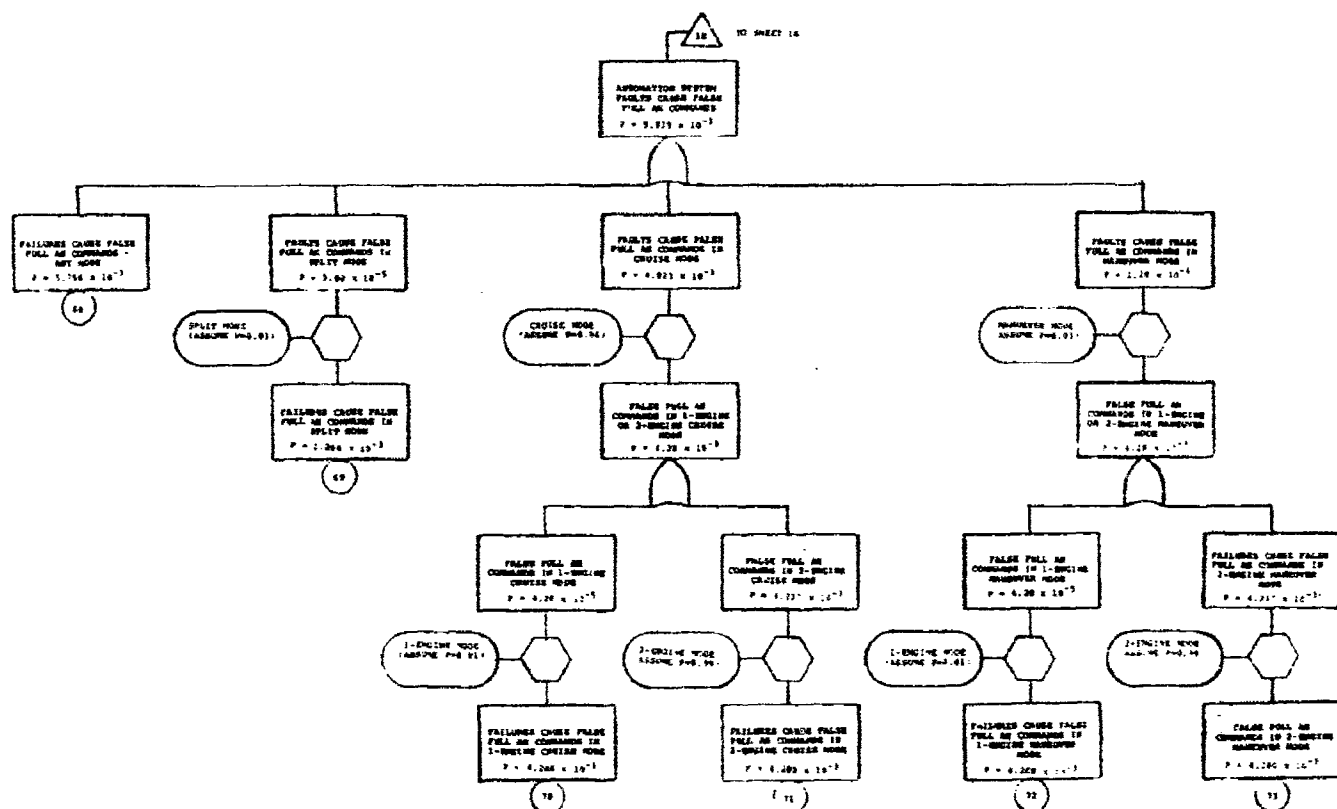














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APPENDIX F
CRITICALITY ANALYSIS SUMMARY SHEETS

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SHIP A NOTE #1 *****

FAILURE EFFECT: Both boilers shutdown (lose control power).

POSSIBLE SYSTEM EFFECTS: Dead in the water.

SYMPTOM OR HOW DETECTED: ERC and local panel would be "dead" (i.e., no lights); obvious indication that control electrical power lost.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Relight 1 or both boilers completely manually (i.e., jack open valves manually, etc.); bring up diesel generator for back-up electrical power; go to harbor feedpump (electrical) for back-up feedpump.

-SECONDARY ACTION: Troubleshoot system via card tester. Isolate and replace defective card. Return to auto operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 11 - Dead in water.
- (b) Maneuvering: 41 - Dead in water.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #2 *****

FAILURE EFFECT: Incomplete, low air flow, or total loss of purge.

POSSIBLE SYSTEM EFFECTS:

- (a) Light-off inhibited.
- (b) Possible explosion if inhibit fails.

SYMPTOM OR HOW DETECTED: No auto light-off. Purge complete light not on, or, purge fail light comes on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually purge system and light boiler manually.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic control.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 24 - Delay in light off.

SHIP A NOTE #3 *****

FAILURE EFFECT: Lose boiler protective trips or protective light-off inhibits.

POSSIBLE SYSTEM EFFECTS: Possible explosion/boiler damage if condition protected against occurs.

SYMPTOM OR HOW DETECTED: Cannot be detected unless condition protected against occurs; then would involve detection of forbidden occurrence.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

- No effect and no action if forbidden condition does not occur.
- If forbidden condition occurs, major repair/restoration required.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #4 *****

FAILURE EFFECT: Inadvertent purge, master F.O. valve closes.

MISSION EFFECT: Boiler shutdown.

SYMPTOM OR HOW DETECTED: Loss of flame and master F.O. valve closed indication.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler shutdown. Proceed on one boiler with reduced capability; relight boiler from local panel.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #5 *****

FAILURE EFFECT: High combustion air (poor air/fuel ratio)

POSSIBLE SYSTEM EFFECT:

- (a) Excessive smoke--white.
- (b) Could blow out flame at low fuel demand.

SYMPTOM OR HOW DETECTED: Windbox pressure gauge on ERC. No alarm for high air. There is alarm for boiler smoke. Boiler will trip if any burner flames out.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators to determine problem. If pressure indicator shows high combustion air, activate remote manual controls or switch fan to low speed. Continue at normal cruising speed. For burner trip, check indicators and annunciator for reason for trip. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system using card tester. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection. Damper could be manually positioned if remote manual not functioning properly.

CRITICALITY EVALUATION: Based on most likely events.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 21 - Not applicable to during light-off.

SHIP A NOTE #6 *****

FAILURE EFFECT: Failure of boiler protection circuits.

MISSION EFFECT: False boiler trip.

SYMPTOM OR HOW DETECTED: Boiler trip alarm; other lights and gauges for:

- (a) Combustion air flow.
- (b) Boiler drum level low.
- (c) Loss of flame.
- (d) Master F.O. valve closed.
- (e) F.O. header pressure.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check lights and instruments. Proceed on one boiler at reduced capacity. Verify that trip was erroneous.

-SECONDARY ACTION: Restart boiler from local panel. Troubleshoot when time permits and return to auto mode.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #7 *****

FAILURE EFFECT: Master F.O. valve open during purge.

POSSIBLE SYSTEM EFFECTS: Ineffective purge if any burner valve open.

SYMPTOM OR HOW DETECTED: Master F.O. valve open/close light.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Abort light-off sequence and verify master F.O. valve status.

-SECONDARY ACTION: Conduct purge and light-off manually; troubleshoot when time permits and return to auto mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage/explosion.

SHIP A NOTE #8 *****

FAILURE EFFECT: Automatic light-off inhibited.

POSSIBLE SYSTEM EFFECTS: No automatic boiler light-off.

SYMPTOM OR HOW DETECTED: One or more light-off sequence indicator lamps do not illuminate.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify that light-off sequence failed; verify that light-off sequence is not legitimately inhibited.

-SECONDARY ACTION: Conduct manual purge and light-off sequence; troubleshoot when time permits and return to auto mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #9 *****

FAILURE EFFECT: Air register stays open.

MISSION EFFECT:

- (1) Fails to light.
- (2) Could blow out flame at low demand.

SYMPTOM OR HOW DETECTED: Ignitor would not extend and burner valve remains closed.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Try a relight. Observe indicators and annunciator for problem.

-SECONDARY ACTION: Manually close air register for light-off. Troubleshoot when time permits.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 35 - Temporary loss of one boiler; reduced RPM.

(c) Light Off: 24 - Delay in light-off.

SHIP A NOTE #10 *****

FAILURE EFFECT: F.O. recirculation valve open during normal operation or light-off.

POSSIBLE SYSTEM EFFECTS:

- (a) Low fuel oil pressure
- (b) Flame out
- (c) Low steam pressure.

SYMPTOM OR HOW DETECTED: Indicator but no alarm or trip for recirculation valve open. Alarm and trip for steam pressure low; alarm for F.O. burner header pressure low.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler shutdown. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system using card tester. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #11 *****

FAILURE EFFECT: Master F.O. valve stays open.

POSSIBLE SYSTEM EFFECTS: Master F.O. valve would not close

on boiler safety trip.

SYMPTOM OR HOW DETECTED: Master F.O. valve open/close indicator; boiler safety trip annunciator.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Close master F.O. valve manually following a boiler trip. Proceed on one boiler.

-SECONDARY ACTION: Troubleshoot when time permits; replace defective component, restart boiler.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage/explosion.
- (b) Maneuvering: 38 - Possible boiler damage/explosion.
- (c) Light-Off: 25 - Possible boiler damage/explosion.

SHIP A NOTE #12 *****

FAILURE EFFECT: One burner shuts down or cannot be lit.

POSSIBLE SYSTEM EFFECTS:

- (1) Light-off not successful.
- (2) Steam demand exceeds production.

SYMPTOM OR HOW DETECTED: Burner on/off indicator, burner valve open/close indicator; burner flame intensity gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Proceed on the remaining two burners.

-SECONDARY ACTION: Troubleshoot when time permits; replace defective component; light burner.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 4 - Temporary loss of one burner, performance degradation.
- (b) Maneuvering: 34 - Temporary loss of one burner, performance degradation.

(c) Light-Off: 23 - Slight delay in light-off.

SHIP A NOTE #13 *****

FAILURE EFFECT: One burner cannot be shut off.

POSSIBLE SYSTEM EFFECTS:

- (1) Burner valve stays open following a trip.
- (2) Steam production exceeds demand.

SYMPTOM OR HOW DETECTED: Burner on/off indicator, burner valve open/close indicator; burner flame intensity gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE: Proceed on the remaining two burners.
- SECONDARY ACTION: Troubleshoot when time permits; replace defective component; light burner.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage/explosion.
- (b) Maneuvering: 38 - Possible boiler damage/explosion.
- (c) Light-Off: 1 - Not applicable during light-off.

SHIP A NOTE #14 *****

FAILURE EFFECT: Light-off sequence timing errors.

POSSIBLE SYSTEM EFFECTS: Light-off sequence incorrect.

SYMPTOM OR HOW DETECTED: Could be difficult to detect; light-off sequence indicators provide some detection capability.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage/explosion.

SHIP A NOTE #15 *****

FAILURE EFFECT: Burner demand management malfunctions.

POSSIBLE SYSTEM EFFECTS: Burner management logic problems.

SYMPTOM OR HOW DETECTED: Superheater outlet pressure low alarm, burner valve open/close indicators, burner on/off indicators, burner flame intensity gauge. Possible turbine trip due to low steam pressure.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and alarm on control console. Activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic manual control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 39 - Large performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #16 *****

FAILURE EFFECT: Lose combustion air.

POSSIBLE SYSTEM EFFECTS: Burner flame out and boiler trip.

SYMPTOM OR HOW DETECTED: Boiler trip annunciator; windbox pressure gauge, FDB discharge pressure gauge, air flow controller gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Attempt to determine cause of trip; relight and operate boiler on manual.

-SECONDARY ACTION: Troubleshoot when time permits; replace defective component; restore auto mode operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #17 *****

FAILURE EFFECT: High combustion air.

MISSION EFFECT:

- (1) Boiler not lit due to high air flow.
- (2) Burners could go out at low demand rates.

SYMPTOM OR HOW DETECTED: Boiler trip annunciator; windbox pressure gauge, FDB discharge pressure gauge, air flow controller gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Attempt to determine cause of tip; relight and operate boiler on manual.

-SECONDARY ACTION: Troubleshoot system when time permits; replace defective component; restore auto mode operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 35 - Possible loss of one boiler, reduced RPM.
- (c) Light-Off: 23 - Slight delay in light-off.

SHIP A NOTE #18 *****

FAILURE EFFECT: Low combustion air.

POSSIBLE FAILURE EFFECTS:

- (a) Black smoke, poor air/fuel ratio.
- (b) Incomplete combustion and possible explosion due to accumulation of unburned fuel.
- (c) Low steam pressure.
- (d) Boiler trip if burner flame out.

SYMPTOM OR HOW DETECTED: Smoke alarm, boiler trip annunciator; windbox pressure gauge, FDB discharge pressure gauge, air flow controller gauge.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE:

Effect (a): Verify alarm and check indicators for problems. If pressure indicator show low combustion air, activate remote manual.

Effect (b): Explosion, boiler down. Continue on one boiler at reduced capability.

Effect (c): Check indicators and annunciator for reason for trip. Continue on one boiler at reduced capability.

-SECONDARY ACTION:

Effect (a): Verify alarm and check indicators on control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

Effect (b): Boiler probably down for rest of cruise. Proceed at reduced speed.

Effect (c): Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

CRITICALITY EVALUATION: Based on most likely events.

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #19 *****

FAILURE EFFECT: Fuel oil, low pressure.

SYSTEM EFFECTS: Loss of flame and boiler trip.

SYMPTOM OR HOW DETECTED: F.O. to burner header pressure low alarm, F.O. service pressure low alarm, fuel flow controller gauge, F.O. header pressure gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control. Restart boiler after completing corrective action.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #20 *****

FAILURE EFFECT: Low fuel oil flow.

FAILURE EFFECT: Low steam pressure at high demand rates.

SYMPTOM OR HOW DETECTED: Would get alarms from low steam pressure. Could get turbine run back or trip. F.O. to burner header pressure low alarm, F.O. service pressure low alarm, fuel flow controller gauge, F.O. header pressure gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm, activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 9 - Large performance degradation.
- (b) Maneuvering: 39 - Large performance degradation, cannot execute maneuvers requiring high steam pressure demand.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #21 *****

FAILURE EFFECT: High fuel oil pressure.

SYSTEM EFFECT: Overfire, high steam pressure.

SYMPTOM OR HOW DETECTED: No alarms for high oil pressure or steam pressure. Excess steam will dump or relief valves open (3 valves). Pressure indicators for fuel oil and steam.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

-SECONDARY ACTION:

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 39 - Large performance degradation.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #22 *****

FAILURE EFFECT: Low fuel oil temperature.

SYSTEM EFFECT: High smoke. Would probably shutdown burners and boilers because scanners indicate loss of flame. Would flame out at around 140°F. or because F.O. too viscous to flow.

SYMPTOM OR HOW DETECTED: F.O. temperature low alarm, F.O. to burner temperature gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler when fuel oil temperature is above 180°F.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM.

- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #23 *****

FAILURE EFFECT: High fuel oil temperature.

SYSTEM EFFECT:

- (a) May get flash on light off.
- (b) No problem under normal auto operation--excessive smoke.

SYMPTOM OR HOW DETECTED: F.O. temperature high alarm; F.O. to burner temperature gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 25 - Possible boiler damage/explosion.

SHIP A NOTE #24 *****

FAILURE EFFECT: High drum level.

SYSTEM EFFECT: Water to turbine, possible turbine damage. Pressure drops when water carries over to superheater.

SYMPTOM OR HOW DETECTED: Drum level high alarm, drum level gauge, feedpump status lamps, feedpump discharge pressure gauge, gauges on feedpump controllers.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine nature of failure; go to manual feedwater control.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 11 - Dead in water.
- (b) Maneuvering: 41 - Dead in water one.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #25 *****

FAILURE EFFECT: Standby feedpump started when primary pump still running.

SYSTEM EFFECT: High feedwater pressure, high drum level.

SYMPTOM OR HOW DETECTED: Drum level high alarm, drum level gauge, feedpump status lamps, feedpump discharge pressure gauge, gauges on feedpump controllers.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually shutdown back-up pump.

-SECONDARY ACTION: Troubleshoot when time permits. Return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.

(c) Light-Off: 22 - No effect.

SHIP A NOTE #26 *****

FAILURE EFFECT: Low drum level.

POSSIBLE SYSTEM EFFECTS:

- (a) Boiler trip.
- (b) High steam temperature, tube or drum failure, steam explosion.
- (c) High drum or tube metal temperature, steam explosion.

SYMPTOM OR HOW DETECTED: Drum level low alarm; drum level low-low trip; drum level gauge, feedpump status lamps, feedpump discharge pressure gauge, gauges on feedpump controllers.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify low water condition. Check analog logic and annunciator. Go to remote manual if electronic problem. Use handjack or emergency feed bypass if not electronic problem. Continue on one boiler at reduced capability.

-SECONDARY ACTION: Restart boiler when water level is within limits. Troubleshoot and correct problem when time permits.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 6 - Temporary loss of one boiler, can damage boiler if immediate corrective action not taken.
- (b) Maneuvering: 36 - Temporary loss of one boiler, can damage boiler if immediate corrective action not taken.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE #27 *****

FAILURE EFFECT: Feedwater recirculation valve stays open.

SYSTEM EFFECT: Possible low feedwater flow, and low drum level.

SYMPTOM OR HOW DETECTED: F.W. recirculation valve open/close indicator; drum level low alarm; drum level low-low trip; drum level gauge; feedpump status lamps; feedpump discharge pressure gauge; gauges on feedpump controllers.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler, reduced RPM.
- (b) Maneuvering: 31 - Not applicable to maneuvering.
- (c) Light-Off: 21 - Not applicable to light-off.

SHIP A NOTE #28 *****

FAILURE EFFECT: Standby control feedwater pump failure.

SYSTEM EFFECT: Low drum level.

SYMPTOM OR HOW DETECTED: Feedpump run/standby/stop indicator lights; drum level low alarm; drum level low-low trip; drum level gauge; feedpump status lamps; feedpump discharge pressure gauge; gauges on feedpump controllers.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump manually activated. Pump not part of control system.

-SECONDARY ACTION: Troubleshoot and repair; return feedpump to auto control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #29 *****

FAILURE EFFECT: Steam high pressure.

SYSTEM EFFECT: Damage turbine, rupture. Rupture tubes, steam explosion. No high pressure alarm or light. Have steam dump and relief valves back-up.

SYMPTOM OR HOW DETECTED: Boiler drum pressure gauge, superheater outlet pressure gauge, gauges on boiler controllers.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Possibility that failure mode not immediately found due to automatic back-up. Very low probability of all back-ups failing. Switch to remote manual control. If remote manual ineffective, activate manual control in field.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 38 - Possible boiler damage/explosion.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #30 *****

FAILURE EFFECT: Lose auto mode control of boiler.

POSSIBLE SYSTEM EFFECTS: Boiler would shutdown and could not be operated in auto mode.

SYMPTOM OR HOW DETECTED: No direct indications; numerous alarms/lamps would indicate abnormal situation.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Relight and operate boiler from local panel.

-SECONDARY ACTION: Troubleshoot and repair; return system to auto mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 5 - Temporary loss of one boiler; reduced RPM.
- (b) Maneuvering: 35 - Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: 24 - Delay in light-off.

SHIP A NOTE # 31 *****

FAILURE EFFECT: Failure of back-up functions in boiler local panel.

POSSIBLE SYSTEM EFFECTS: Lose boiler local panel back-up.

SYMPTOM OR HOW DETECTED: Probably would not be detected in auto mode; numerous abnormal indications would occur in boiler front mode.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: No effect in auto mode; would have to go to manual operation of valves, ignitors, etc. if boiler front operation attempted.

-SECONDARY ACTION: Troubleshoot and repair; might have to take boiler out-of-service to accomplish this.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #32 *****

FAILURE EFFECT: Loss of S.H. steam cooling.

POSSIBLE SYSTEM EFFECTS: Possible high S.H. steam temperature.

SYMPTOM OR HOW DETECTED: Steam temperature high alarm; superheater outlet temperature gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Go to manual control of S.H. steam temperature control loop.

-SECONDARY ACTION: Troubleshoot and repair; return to auto temperature control mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #33 *****

FAILURE EFFECT: Steam, superheated. Low temperature.

POSSIBLE SYSTEM EFFECTS: Degrades performance. Could result in wet steam in turbine.

SYMPTOM OR HOW DETECTED: Temperature indicators, but no alarms.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Good possibility that failure mode not noticed due to no alarm and no auto back-up. Could result in turbine damage. When problem noticed, switch to remote manual.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during normal steaming.

SHIP A NOTE #34 *****

FAILURE EFFECT: Lose atomizing steam pressure control.

POSSIBLE SYSTEM EFFECTS:

- (a) Possible flame out if pressure too low.
- (b) Possible damage to piping or burner nozzles if pressure too high.

SYMPTOM OR HOW DETECTED: Atomizing steam pressure low alarm; atomizing steam pressure gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Go to manual control of atomizing steam pressure control loop.

-SECONDARY ACTION: Troubleshoot and repair; return to auto pressure control mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage/explosion.
- (b) Maneuvering: 38 - Possible boiler damage/explosion.
- (c) Light-Off: 23 - Slight delay in light-off.

SHIP A NOTE #35 *****

FAILURE EFFECT: Lose gland steam pressure control.

POSSIBLE SYSTEM EFFECTS:

- (a) Possible loss of vacuum and turbine trip if pressure too low.
- (b) Possible damage to piping if pressure too high.

SYMPTOM OR HOW DETECTED: Gland steam pressure. Low alarm, condenser vacuum low alarm, gland steam pressure gauge, ahead chest pressure gauge, astern chest pressure gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Go to manual control of gland steam pressure control loop.

-SECONDARY ACTION: Troubleshoot and repair; return to auto pressure control mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #36 *****

FAILURE EFFECT: Difference between bleed steam pressure and turbine pressure.

POSSIBLE SYSTEM EFFECTS: Possible backflow of steam into turbine.

SYMPTOM OR HOW DETECTED: Bleed steam and turbine steam pressure gauges; possible turbine trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of problem; go to manual control to the extent necessary.

-SECONDARY ACTION: Replace defective components; return to auto operation.

CRITICALITY EVALUATION:

Mission Effects:

35a:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

36b:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #37 *****

FAILURE EFFECT: Excessive steam release to condenser.

POSSIBLE SYSTEM EFFECTS: Rise in condenser level and possible loss of vacuum.

SYMPTOM OR HOW DETECTED: Condenser hotwell level high alarm; possible turbine trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of problem; go to manual control of exhaust steam and steam dump system.

-SECONDARY ACTION: Replace defective components; return to manual operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #38 *****

FAILURE EFFECT: DS steam never dumped to exhaust system.

POSSIBLE SYSTEM EFFECTS: Possible DS steam line overpressure.

SYMPTOM OR HOW DETECTED: No indicators available.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of problem; go to manual control of exhaust steam and steam dump system.

-SECONDARY ACTION: Replace defective components; return to manual operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #39 *****

FAILURE EFFECT: Lose control of exhaust header pressure.

POSSIBLE SYSTEM EFFECTS: Possible exhaust headeroverpressure.

SYMPTOM OR HOW DETECTED: No indicators available.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of problem; go to manual control of exhaust steam and steam dump system.

-SECONDARY ACTION: Replace defective components; return to manual operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #40 *****

FAILURE EFFECT: Lose high SH steam header pressure protection.

POSSIBLE SYSTEM EFFECTS: Possible SH steam header over pressure.

SYMPTOM OR HOW DETECTED: No indicators available.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of problem; go to manual control of exhaust steam and steam dump system.

-SECONDARY ACTION: Replace defective components; return to manual operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.

(c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #41 *****

FAILURE EFFECT: Lose exhaust steam dump.

POSSIBLE SYSTEM EFFECTS:

- (a) Possible exhaust header overpressure.
- (b) Possible eventual depletion of F.W.

SYMPTOM OR HOW DETECTED: No indicators available.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of problem; go to manual control of exhaust steam and steam dump system.

-SECONDARY ACTION: Replace defective components; return to manual operation.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #42 *****

FAILURE EFFECT: Deaerator high level.

SYSTEM EFFECT: No effect.

SYMPTOM OR HOW DETECTED: DC heater level high alarm; relief valve opens.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm activate remote manual or

manual control.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #43 *****

FAILURE EFFECT: Deaerator low level.

SYSTEM EFFECT: Possible low drum feedwater level.

SYMPTOM OR HOW DETECTED: DC heater level low alarm. Also, low drum level alarm and trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #44 *****

FAILURE EFFECT: Lose feed heater control.

SYSTEM EFFECT: Loss in efficiency; possible damage to heater.

SYMPTOM OR HOW DETECTED: No alarms or indicators provided.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine nature of problem; to manual control of feedheater.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #45 *****

FAILURE EFFECT: L.O. supply to turbine shut-off.

POSSIBLE SYSTEM EFFECTS: Turbine trip on low L.O. pressure or turbine damage.

SYMPTOM OR HOW DETECTED: L.O. header pressure low alarm; turbine trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Attempt to clear alarm; go to manual control of L.O. control loop.

-SECONDARY ACTION: Replace defective component; return to

auto mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #46 *****

FAILURE EFFECT: Lube oil pump stops.

SYSTEM EFFECT: L.O. pressure low.

SYMPTOM OR HOW DETECTED: L.O. header pressure low alarm;
L.O. pump status indicators.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump automatically starts.

-SECONDARY ACTION

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #47 *****

FAILURE EFFECT: Lose auto start of standby L.O. pump.

POSSIBLE SYSTEM EFFECTS: Lose L.O. pump redundancy.

SYMPTOM OR HOW DETECTED: L.O. header pressure low alarm;
L.O. pump status indicators.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE: Start standby pump manually.
- SECONDARY ACTION: Replace defective component.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #48 *****

FAILURE EFFECT: Condenser hotwell level fall.

POSSIBLE SYSTEM EFFECTS: Possible damage to condensate equipment.

SYMPTOM OR HOW DETECTED: No alarms or indicators provided.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE: Attempt to identify nature of problem; operate condensate system on manual.
- SECONDARY ACTION: Troubleshoot and replace defective component; return to auto mode.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 9 - Large performance degradation.
- (b) Maneuvering: 39 - Large performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP A NOTE #49 *****

FAILURE EFFECT: Lose auto start of standby condensate pump.

POSSIBLE SYSTEM EFFECTS: Lose condensate pump redundancy.

SYMPTOM OR HOW DETECTED: Condensate pump status indicators; condensate pump discharge pressure gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Start standby pump manually.

-SECONDARY ACTION: Replace defective component.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #50 *****

FAILURE EFFECT: Condensate pump shuts down.

POSSIBLE SYSTEM EFFECTS: Condenser level rise.

SYMPTOM OR HOW DETECTED: Condensate pump status indicators; condensate pump discharge pressure gauge; hotwell level high alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump starts automatically.

-SECONDARY ACTION:

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

SHIP A NOTE #51 *****

FAILURE EFFECT: Lose auto start of standby vacuum pump.

POSSIBLE SYSTEM EFFECTS: Lose vacuum.

SYMPTOM OR HOW DETECTED: Vacuum pump status indicators, vacuum low alarm, condenser vacuum gauge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Start standby pump manually.

-SECONDARY ACTION: Replace defective component.

CRITICALITY EVALUATION:

Mission Effects:

(a) Normal Steaming: 2 - No effect.

(b) Maneuvering: 32 - No effect.

(c) Light-Off: 22 - No effect.

SHIP A NOTE #52 *****

FAILURE EFFECT: Lose condensate dump capability.

SYSTEM EFFECT: Deaerator level rise.

SYMPTOM OR HOW DETECTED: DC heater level high alarm; relief valve opens.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP 8 NOTE #1 *****

FAILURE EFFECT: High combustion air, did not decrease during light-off.

SYSTEM EFFECT: Boiler not lit due to high air flow.

SYMPTOM OR HOW DETECTED: Boiler trips due to no flame.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Make second attempt to light burners and monitor indicators for problem.

-SECONDARY ACTION: Manually set fan on low and light boiler. Troubleshoot system when time permits.

-CRITICALITY EVALUATION:

(a) Normal Steaming: Not applicable to this phase.

(b) Maneuvering: Not applicable to this phase.

(c) Light-Off: Slight delay in light-off.

SHIP 8 NOTE #4 *****

FAILURE EFFECT: Loss of combustion air--fan fails.

SYSTEM EFFECT: Open switch in fan would trip boiler.

SYMPTOM OR HOW DETECTED: Switch in contacts of motor sequence-V. Alarms ECC, and BF (also alarm for lo air). Lights stop, slow, fast ECC and BF.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #5 *****

FAILURE EFFECT: Loss of automation combustion air control.

SYSTEM EFFECT: Air varies--stays within limits.

SYMPTOM OR HOW DETECTED: No alarm. Smoke, poor combustion.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #6 *****

FAILURE EFFECT: Air register open during light off.

SYSTEM EFFECT: Fails to light.

SYMPTOM OR HOW DETECTED: Ignitor would not extend and burner valve remains closed.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Try a relight. Observe indicators and annunciator for problem.

-SECONDARY ACTION: Manually close air register for light-off. Troubleshoot when time permits.

-CRITICALITY EVALUATION:

- (a) Normal Steaming: Not applicable to this phase.
- (b) Maneuvering: Not applicable to this phase.
- (c) Light Off: Slight delay in light-off.

SHIP B NOTE #7 *****

FAILURE EFFECT: Air register closed during normal operation

POSSIBLE SYSTEM EFFECTS:

- (a) Poor combustion.
- (b) Possible flame out.

SYMPTOM OR HOW DETECTED: Limit switch trips burner or burner shuts down due to flame out.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

-SECONDARY ACTION: Manually open air register and restart burner. Troubleshoot system when time permits.

-CRITICALITY EVALUATION OF MOST LIKELY EVENTS:

- (a) Normal Steaming: Temporary loss of one burner, performance degradation.
- (b) Maneuvering: Temporary loss of one burner, performance degradation.
- (c) Light-Off: Failure mode not applicable to this phase.

SHIP B NOTE #8 *****

FAILURE EFFECT: Air register closed during purge.

POSSIBLE SYSTEM EFFECTS:

- (a) Purge abort.
- (b) Inadequate purge, possible explosion if boiler shutdown due to lack of air (excess fuel).

SYMPTOM OR HOW DETECTED: Air register closed light. Logic would abort purge.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Attempt second purge and observe indicators and annunciators.

-SECONDARY ACTION: Manually open air register and purge boiler. Troubleshoot system when time permits.

CRITICALITY EVALUATION:

- (a) Normal Steaming: Not applicable to this phase.
- (b) Maneuvering: Not applicable to this phase.
- (c) Light-Off: Slight delay in light-off.

SHIP B NOTE #9 *****

FAILURE EFFECT: Automated control fails to shut down boiler when atomizing steam pressure is low.

POSSIBLE SYSTEM EFFECTS:

- (a) Poor atomization results in poor flame/smoke.
- (b) Possible explosion from unburned fuel.

SYMPTOM OR HOW DETECTED: Pressure switch vital alarm. Pressure indicators in boiler front and engine room control console. Pressure switch normally open closes at 125 PSI--open switch will close burner valve.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Low atomizing steam pressure not part of automated control. Would first determine reason for low pressure and take corrective action.

-SECONDARY ACTION: Determine why pressure switch failed to open.

-CRITICALITY EVALUATION:

- (a) Normal Steaming: Slight performance degradation.
- (b) Maneuvering: Slight performance degradation.

(c) Light-Off: Delay in light-off.

SHIP B NOTE #10 *****

FAILURE EFFECT: Atomizing steam.

SYSTEM EFFECT: High pressure.

SYMPTOM OR HOW DETECTED: Vital alarm--PS 205, 206.
Hi 168 PSI pressure indicators BF and ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #11 *****

FAILURE EFFECT: Atomizing steam.

SYSTEM EFFECT: Wet steam.

SYMPTOM OR HOW DETECTED:

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #12 *****

FAILURE EFFECT: Burner management problem.

POSSIBLE SYSTEM EFFECTS: Burner management logic problem, true or false.

- (a) Combustion control in low fire.
- (b) Burner management in manual.
- (c) Burner tripped.
- (d) Ignitor problem

SYMPTOM OR HOW DETECTED: Nonvital alarm. Indicator lights for all.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm, activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic controls.

CRITICALITY EVALUATION:

- (a) Normal Steaming: Slight performance degradation.
- (b) Maneuvering: Slight performance degradation.
- (c) Light-Off: Failure mode not applicable in this phase.

SHIP B NOTE #13 *****

FAILURE EFFECT: Boiler smoking.

SYSTEM EFFECT: Wager system, 20% scale.

SYMPTOM OR HOW DETECTED: Alarm NV ECC and BF.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP 8 NOTE #14 *****

FAILURE EFFECT: Failure of boiler protection circuits.

SYSTEM EFFECT: False boiler trip.

SYMPTOM OR HOW DETECTED: Vital group alarm for engine room control console, boiler front and boiler console. First out lights.

- (a) Operator trip.
- (b) Combustion air flow--low. Pressure switch set at 0.1 WC (same as alarm).
- (c) Boiler drum level low--low level switch set at 8" Below (alarm set at 5").
- (d) Fuel oil pressure low. Pressure switch set at 40 PSI (same as alarm).
- (e) Loss of all flame.
- (f) All burner oil valves closed.
- (g) Unsuccessful shutdown.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check first out lights and instruments. Proceed on one boiler at reduced capacity. Verify that trip was erroneous.

-SECONDARY ACTION: Restart boiler and activate remote manual for erroneous function. Troubleshoot when time permits.

CRITICALITY EVALUATION

- (a) Normal Steaming: Temporary loss of one burner, performance degradation.
- (b) Maneuvering: Not applicable to this phase.
- (c) Light-Off: Delay in light-off.

SHIP B NOTE #15 *****

FAILURE EFFECT: Condensate.

SYSTEM EFFECT: Aux condenser vacuum low. PS-321, 22" Hg.

SYMPTOM OR HOW DETECTED: Alarm V, ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #16 *****

FAILURE EFFECT: Aux condenser level high.

SYSTEM EFFECT: LS-319 (Gems) 11.5" above bottom of hotwell

SYMPTOM OR HOW DETECTED: Alarm NV ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP 3 NOTE #17 *****

FAILURE EFFECT: Aux condenser pump failure.

SYSTEM EFFECT: Motor contact switch.

SYMPTOM OR HOW DETECTED: Alarm NV ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP 6 NOTE #18 *****

FAILURE EFFECT: Condensate Main condenser.

SYSTEM EFFECT: INBD main pump failure.

SYMPTOM OR HOW DETECTED: Alarm V, ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #19 *****

FAILURE EFFECT: Main condenser vacuum low.

SYSTEM EFFECT: PS-301, 24" Hg.

SYMPTOM OR HOW DETECTED: Alarm V ECC, signal to throttle control.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #20 *****

FAILURE EFFECT: OUTBD pump failure.

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED: Alarm NV ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #21 *****

FAILURE EFFECT: Main condenser level high.

SYSTEM EFFECT: Level switch LS 304--13" above bottom of hotwell.

SYMPTOM OR HOW DETECTED: Alarm V ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #22 *****

FAILURE EFFECT: Console power on battery.

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED: Alarm V ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #23 *****

FAILURE EFFECT: Control module power failure.

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED: Alarm V ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #24 *****

FAILURE EFFECT: Deaerator high level.

SYSTEM EFFECT: No effect.

SYMPTOM OR HOW DETECTED: Vital alarm in engine room control console. Level transmitter set at 81" (high). Relief valve opens.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 61 - Not applicable during this phase.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 2 - No effect.
- (c) Light-Off: 21 Not applicable during light-off.

FAILURE RATE:

- Transducers = 6.63
- Valves = 49.14
- Electronics = 9.8930
- Total = 65.6630

SHIP B NOTE #25 *****

FAILURE EFFECT: Deaerator low level.

SYSTEM EFFECT: Low drum feedwater level.

SYMPTOM OR HOW DETECTED: Vital alarm in engine room control console. Level transmitter set at 45" (low). Also, low drum level alarm and trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable during this phase.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

- Transducers = 6.25
- Valves = 16.38
- Electronics = 9.8441
- Total = 32.4741

SHIP B NOTE #26 *****

FAILURE EFFECT: Deaerator.

SYSTEM EFFECT: Feedpump overspeed/trip could fail due to lack of water.

SYMPTOM OR HOW DETECTED:

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #27 *****

FAILURE EFFECT: Feedwater recirculation valve opens during high demand.

SYSTEM EFFECT: Possible low feedwater flow, and low drum level.

SYMPTOM OR HOW DETECTED: No alarm or indicator except for low drum level and low drum level trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and restart boiler.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 1 - Not applicable to maneuvering.
- (c) Light-Off: 1 - Not applicable to light-off.

FAILURE RATE:

-Transducers = 19.64
-Electronics = 2.8308
-Valves = 16.38
Total = 38.8508

SHIP B NOTE #28 *****

FAILURE EFFECT: Feedwater recirculation valve closes during low demand.

SYSTEM EFFECT: Possible pump overheat, pump failure.

SYMPTOM OR HOW DETECTED: No alarm or indicator. Back-up pump would activate if primary failed.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump automatically activated.

-SECONDARY ACTION: Loss of back-up pump. Could be dead in water if second pump fails. Crew would try to repair failed pump.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 5 - Auto back-up--back-up takes over function.
- (b) Maneuvering: 35 - Auto back-up--back-up takes over function.
- (c) Light-Off: 61 - Not applicable during this phase.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light Off: 22 - No effect.

FAILURE RATE:

-Transducers = 9.64
-Valves = 16.38
-Electronics = 3.7744
Total = 29.7944

SHIP B NOTE #29 *****

FAILURE EFFECT: Feedwater control pump failure.

SYSTEM EFFECT: Low drum level.

SYMPTOM OR HOW DETECTED: Pressure sensor set at 800 PSI, vital alarm in engine room control console, light--run, standby, stop.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump automatically activated. Pump not part of control system.

-SECONDARY ACTION: Crew would try repair failed pump.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 5 - Auto back-up -- back-up takes over function.
- (b) Maneuvering: 35 - Auto back-up -- back-up takes over function.
- (c) Light-off: 65 - Auto back-up -- back-up takes over function.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-off: 62 - No effect.

SHIP B NOTE #30 *****

FAILURE EFFECT: Feedwater pump

SYSTEM EFFECT: Lube oil pressure low.

SYMPTOM OR HOW DETECTED: Alarm NV, ECC. Pressure indicator PI 337 25 PSI (?), not part of GR controls

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #31 *****

FAILURE EFFECT: Feedwater pump.

SYSTEM EFFECT: Lube oil temp high.

SYMPTOM OR HOW DETECTED: Alarm ECC, NV. Resistance temp device RTD 331 160F, temp indicator ECC TI 331.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP 8 NOTE #32 *****

FAILURE EFFECT: Boiler feedpump heater pressure low.

SYSTEM EFFECT: Low drum level

SYMPTOM OR HOW DETECTED: Pressure sensor set at 850 PSIG, alarm for engine room control console and boiler front (separate pressure transmitter to control logic and engine room control console indicator redundant).

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm, activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

-Transducers = 6.13

SHIP B NOTE #33 *****

FAILURE EFFECT: Standby feedpumps started when primary pump still running.

SYSTEM EFFECT: High feedwater pressure, high drum level.

SYMPTOM OR HOW DETECTED: Nonvital alarm for engine room control console. Relief valve pops.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually shutdown back-up pump.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic control.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 62 - No effect.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

FAILURE RATE:

-Electronics = 3.99407

SHIP B NOTE #34 *****

FAILURE EFFECT: High feedwater level.

SYSTEM EFFECT:

- (a) No effect.
- (b) Possible spill over to turbine.

SYMPTOM OR HOW DETECTED: Non vital alarm for engine room control console. Relief valve pops. Possible turbine MPC or trip.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE: Switch to remote manual and lower level.
- SECONDARY ACTION: Troubleshoot system when time permits and replace defective card. Return to automatic control.

CRITICALITY EVALUATION:

34a--System Effects:

- (a) Normal Steaming: 3 - Alarm, activate remote manual.
- (b) Maneuvering: 33 - Alarm, activate remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

34a--Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

34b--System Effects:

- (a) Normal Steaming: 20 - Loss of protective feature.
- (b) Maneuvering: 50 - Loss of protective feature.
- (c) Light-Off: 80 - Loss of protective feature.

34b--Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 22 - No effect.

FAILURE RATE:

34a: Transducers = 4.122
Electronics = 53.2910
Total = 57.4130

34b: Transducers = 0.458
Electronics = 5.9212
Total = 6.3792

SHIP B NOTE #35 *****

FAILURE EFFECT: Low feedwater drum level.

POSSIBLE SYSTEM EFFECTS:

- (a) Boiler trip.
- (b) High steam temperature, tube or drum failure, steam explosion.
- (c) High drum or tube metal temperature, steam explosion.

SYMPTOM OR HOW DETECTED: Indicators and alarms set at low 5" below drum center line. Also lo lo level trip to Bxn, Mgmt. Lo lo level switch set at 8" below center line. Tubes exposed at 10".

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify low water by observing gauge glass and yawway on boiler front. Check analog logic and annunciator. Go to remote manual if electronic problem. Use handjack or emergency feed bypass if not electronic problem. Continue on one boiler at reduced capability.

-SECONDARY ACTION: Restart boiler when water level is within limits. Troubleshoot and correct problem when time permits.

CRITICALITY EVALUATION:

35a--System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and restart boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and restart boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

35a--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 24 - Delay in light-off.

35b--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: 61 - Not applicable during this phase.

35b--Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

35c--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: 61 - Not applicable during this phase.

35c--Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

35a: Transducers = 1.26
Electronics = 33.7113
Total = 34.9713

35b: Transducers = 0.63
Electronics = 16.8556
Total = 17.5856

35c: Transducers = 2.210
Electronics = 5.6185
Total = 5.8285

SHIP B NOTE #36 *****

FAILURE EFFECT: Fuel oil.

SYSTEM EFFECT: Loss of ECC remote maneuver control.

SYMPTOM OR HOW DETECTED:

MOST LIKELY ACTION AND SYSTEM STATUS
-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #37 *****

FAILURE EFFECT: Fuel oil.

SYSTEM EFFECT: Loss of automatic control, variation in pressure.

SYMPTOM OR HOW DETECTED: Header pressure low alarm NV, PS706, 150 PSI. Header pressure indicator PI 707, boiler pressure low alarm PS 715 (starboard), boiler PI 717 ECC and PI 719 BF (SB).

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #38 *****

FAILURE EFFECT: Fuel oil, low pressure.

SYSTEM EFFECT:

- (a) Boiler trip, low pressure.
- (b) Loss of flame, no flame boiler trip.

SYMPTOM OR HOW DETECTED: Low F.O. pressure will trip boiler control valve at 40 PSI.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control. Restart boiler after completing corrective action.

CRITICALITY EVALUATION:

38a--System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and re-start boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

38a--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 24 - Delay in light-off.

38b--System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and re-start boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

38b--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

38a: Electronics = 2.9689
Valves = 10.008
Total = 12.9769

38b: Electronics = 1.9793
Valves = 6.672
Total = 8.6513

SHIP 8 NOTE #39 *****

FAILURE EFFECT: High FO, hi atm press

SYSTEM EFFECT: (a) High steam pressure.

SYMPTOM OR HOW DETECTED: No alarms for high oil pressure or steam pressure. Excess steam will dump or relief valves open (3 valves). Pressure indicators for fuel oil and steam.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

-SECONDARY ACTION:

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 11 - No alarm--only light or indicators
- (b) Maneuvering: 41 - No alarm--only light or indicators.
- (c) Light-Off: 61 - No alarm--only light or indicators.

Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

- Transducers = 0.50
- Electronics = 8.0536
- Valves = 16.98
- Total = 25.5336

SHIP B NOTE #40 *****

FAILURE EFFECT: Fuel flow does not decrease for light-off.

SYSTEM EFFECT: (a) Flash or explosion.

SYMPTOM OR HOW DETECTED: Obvious flash, explosion, or loss of flame. Manually shutdown boiler and assess damage.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

-Relays = 0.0495

SHIP B NOTE #41 *****

FAILURE EFFECT: F.O. service pump discharge strainer

SYSTEM EFFECT: High differential pressure high.

SYMPTOM OR HOW DETECTED: High differential pressure alarm.
PS-705 setpoint 8 PSI P, alarm NV.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP 8 NOTE #42 *****

FAILURE EFFECT: Low fuel oil flow.

SYSTEM EFFECT:

- (a) Low steam pressure.
- (b) Possible flame-out.

SYMPTOM OR HOW DETECTED: No alarm or indicator--would get alarms from lo steam pressure. Could get turbine run back or trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm, activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

42a--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 3 - Alarm --activate remote manual.
- (c) Light-Off: 61 - Not applicable during this phase.

42a--Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicalbe during light-off.

42b--System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and re-start boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 61 - Not applicable during this phase.

42B--Mission Effects:

- (a) Normal Steaming: 5 - Auto back-up--back-up takes over function.
- (b) Maneuvering: 35 - Auto back-up--back-up takes over function.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

42a: Electronics = 5.9981
Relays = 0.0534
Transducers = 8.6760
Total = 14.7275

42b: Electronics = 3.9989
Relays = 0.0712
Transducers = 5.7840
Total = 9.8541

SHIP B NOTE #43 *****

FAILURE EFFECT: High fuel oil flow.

SYSTEM EFFECT:

- (a) Excessive black smoke (if air low).
- (b) High steam pressure.
- (c) Possible explosion when F.O. increase leads air.

SYMPTOM OR HOW DETECTED: No alarm or indicator for high F.O. flow. Would get alarm for smoke. High steam pressure would dump and relief valves pop. Would check steam pressure on pressure indicator.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Switch to remote manual. Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

-SECONDARY ACTION :

CRITICALITY EVALUATION:

43a--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

43a--Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.

(c) Light-Off: 21 - No effect.

43b--System Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 61 - Not applicable to this phase.

43b--Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable during light-off.

43c--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: 61 - Not applicable to this phase.

43d--Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 37 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

43a: Electronics = 7.5860
Relays = 0.0801
Transducers = 5.9360
Total = 13.6021

43b: Electronics = 3.9244
Relays = 0.0400
Transducers = 4.4520
Total = 8.4164

43c: Electronics = 1.5707
Relays = 0.0133
Transducers = 4.4520
Total = 6.0360

SHIP B NOTE #44 *****

FAILURE EFFECT: Low fuel oil temperature.

SYSTEM EFFECT: High smoke. Would probably shutdown burners and boilers because scanners indicate loss of flame. Would flame out at around 140°F.

SYMPTOM OR HOW DETECTED: Controller, resistance temp device, temp indicators for engine room control console and boiler front, vital alarms for engine room control console and boiler room low at 180°F. Boiler trip alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler when fuel oil temperature is above 180°F.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and restart boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and restart boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

-Transducers = 2.00
-Electronics = 10.9649
-Valves = 18.70
Total = 31.6649

SHIP B NOTE #45 *****

FAILURE EFFECT: Low fuel oil temperature--light off.

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED:

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #46 *****

FAILURE EFFECT: High fuel oil temperature.

SYSTEM EFFECT: May get flash on light off. No problem under normal auto operation--excessive smoke.

SYMPTOM OR HOW DETECTED: Alarms/indicators, high--245°F. Alarm and controller are different RTD's. Also smoke alarms.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

-Transducers = 2.2208
 -Electronics = 7.8389
 -Valves = 17.35
 Total = 27.4097

SHIP B NOTE #47 *****

FAILURE EFFECT: Recirculation valve open during normal operation or light-off.

POSSIBLE SYSTEM EFFECTS:

- (a) Low fuel oil pressure
- (b) Flame out
- (c) Low steam pressure.

SYMPTOM OR HOW DETECTED: No alarm or trip for recirculation valve open. Should inhibit light-off if open. Alarms and trip for low fuel pressure and steam pressure.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshooting system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

-CRITICALITY EVALUATION:

- (a) Normal Steaming: Temporary loss of one boiler, reduce

RPM.

- (b) Maneuvering: Not applicable to this phase.
- (c) Light-Off: Delay in light-off.

SHIP B NOTE #48 *****

FAILURE EFFECT: Lube oil, turbine.

SYSTEM EFFECT: (a) Activate pump with suction or discharge valves closed.
(b) Loss of lube oil standby.
(c) Both pumps running at same time.

SYMPTOM OR HOW DETECTED:

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #49 *****

FAILURE EFFECT: Lube pump activate with suction or discharge valves closed.

SYSTEM EFFECT: Loss of lube oil.

SYMPTOM OR HOW DETECTED: Vital alarm for engine room control console. Pressure switch set at 20 PSI.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicator lights.
Back-up pump automatically starts.

-SECONDARY ACTION:

-CRITICALITY EVALUATION:

- (a) Normal Steaming: No effect.
- (b) Maneuvering: No effect.
- (c) Light-Off: No effect.

SHIP B NOTE #50 *****

FAILURE EFFECT: Lube oil, turbine. Pump failure.

SYSTEM EFFECT: Pressure low. Pressure switch open at 10 PSI, close at 4 PSI.

SYMPTOM OR HOW DETECTED: Vital alarm for engine room control console.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump automatically starts.

-SECONDARY ACTION:

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 5 - Auto back-up--back-up takes over function.
- (b) Maneuvering: 35 - Auto back-up--back-up takes over function.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Switches = 1.4500
-Electronics = 1.4989
Total = 2.9489

SHIP B NOTE #51 *****

FAILURE EFFECT: Lube oil, turbine.

SYSTEM EFFECT: Decharge filter differential pressure.

SYMPTOM OR HOW DETECTED: PS-607, 15 PSI P. Alarm NV ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #52 *****

FAILURE EFFECT: Lube oil turbine.

SYSTEM EFFECT: Oil sump low.

SYMPTOM OR HOW DETECTED: Gems le switch--18" below top.
Alarm V ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #53 *****

FAILURE EFFECT: Lube oil, turbine

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED: Alarm NV ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #54 *****

FAILURE EFFECT: Lube oil, turbine

SYSTEM EFFECT: Lube oil coalescer differential pressure.
Differential pressure switch, 35 PSI P.

SYMPTOM OR HOW DETECTED: Alarm NV ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #55 *****

FAILURE EFFECT: Lube oil, turbine.

SYSTEM EFFECT: Temperature off limits.

SYMPTOM OR HOW DETECTED: Alarm V ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #56 *****

FAILURE EFFECT: Inadvertent purge.

SYSTEM EFFECT: Could blow out flame during low demand or light-off.

SYMPTOM OR HOW DETECTED: Loss of flame and burner or boiler tripped alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually switch fan to low. Check indicators and annunciator for reason for boiler trip. Proceed on one boiler with reduced capability.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic control.

-CRITICALITY EVALUATION:

- (a) Normal Steaming: No effect.
- (b) Maneuvering: Temporary loss of one boiler, degraded performance. Cannot execute extreme maneuvers on re-remaining boiler.
- (c) Light-Off: Delay in light-off.

SHIP B NOTE #57 *****

FAILURE EFFECT: Incomplete low air flow or total loss of purge.

POSSIBLE SYSTEM EFFECTS:

- (a) Light-off inhibited.
- (b) Possible explosion if inhibit fails.

SYMPTOM OR HOW DETECTED: No auto light-off. Purge complete light not on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually purge system and light boiler manually.

-SECONDARY ACTION: Troubleshoot digital logic when time permits and replace defective card. Return to automatic control.

CRITICALITY EVALUATION

- (a) Normal Steaming: No effect.
- (b) Maneuvering: No effect.
- (c) Light-Off: Delay in light off.

SHIP B NOTE #58 *****

FAILURE EFFECT: Steam, superheated. Low pressure.

SYSTEM EFFECT: Turbine reduce RPM/trips (at 775 to 650). Also reduces steam to electrical generators. Could have secondary failure due to low electrical power.

SYMPTOM OR HOW DETECTED: Pressure transmitter set at 830 PSI. Pressure indicator in engine room control console and boiler front. Lo pressure vital alarm for engine room control console and boiler front.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

-SECONDARY ACTION: Troubleshoot system using analog test

station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 8 - Turbine MPC reduces RPM--trouble-shoot and resume normal RPM's.
- (b) Maneuvering: 38 - Turbine MPC reduces RPM--trouble shoot and resume normal RPM's.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 9 - Large performance degradation.
- (b) Maneuvering: 39 - Large performance degradation. Cannot execute maneuvers requiring high steam pressure demand.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Transducers = 36.76
-Electronics = 21.3959
Total = 58.1559

SHIP 8 NOTE #59 *****

FAILURE EFFECT: Steam high pressure.

SYSTEM EFFECT:

- (a) Have steam dump and three relief valves back-up.
- (b) Rupture tubes and drum, steam explosion. No high pressure alarm or light.

SYMPTOM OR HOW DETECTED: Pressure indicators.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Possibility that failure mode not immediately found due to automatic back-up. Very low probability of all back-ups failing. Switch to remote manual control. If remote manual ineffective, activate manual control in field.

-SECONDARY ACTION: Troubleshoot system using analog test

station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

59a--System Effects:

- (a) Normal Steaming: 5 - Auto back-up--back-up takes over function.
- (b) Maneuvering: 35 - Auto back-up--back-up takes over function.
- (c) Light-Off: 61 - Not applicable to this phase.

59a--Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 21 - Not applicable to this phase.

59b--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: 61 - Not applicable during this phase.

59b--Mission Effects:

- (a) Normal Steaming: 7 - Possible boiler damage.
- (b) Maneuvering: 37 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

59a: Transducers = 18.38
Electronics = 9.7525
Total = 28.1325

59b: Transducers = 18.38
Electronics = 9.0317
Total = 27.4117

SHIP B NOTE #60 *****

FAILURE EFFECT: Steam, superheated. Low temperature.

SYSTEM EFFECT: Could result in wet steam in turbine.

SYMPTOM OR HOW DETECTED: Temperature indicators, but no

alarms.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Good possibility that failure mode not noticed due to no alarm and no auto back-up. Could result in turbine damage. When problem noticed, switch to remote manual.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 11 - No alarm--only lightbar indicators show problem condition.
- (b) Maneuvering: 41 - No alarm--only lightbar indicators show problem condition.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

- Transducers = 19.66
- Electronics = 23.9891
- Sensors = 2.2208
- Valves = 32.76
- Total = 78.6299

SHIP 8 NOTE #61 *****

FAILURE EFFECT: Steam, superheated. High steam temperature.

SYSTEM EFFECT: Tube rupture (superheater tube) steam explosion.

SYMPTOM OR HOW DETECTED: Resistance temperature device set at 970°F. Vital alarms for engine room control console and boiler front. Temperature indicators for engine room control console and boiler front.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable during this phase.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

- Transducers = 9.64
- Electronics = 14.9915
- Valves = 32.76
- Sensors = 5.076
- Total = 62.8991

SHIP B NOTE #62 *****

FAILURE EFFECT: Throttle control.

SYSTEM EFFECT: Throttle control problem non-critical.

SYMPTOM OR HOW DETECTED: Alarm NV, ECC-group.

- (a) Boiler drum high--LT-348 and LT-347, 5" to 8" above dr centerline.
- (b) Steam pressure low, PT-107, 108, 775 to 650 PSI.
- (c) Excess vibration. Viac system.
- (d) Overspeed limiting, 103 to 112%.
- (e) Electronic supply failure.
- (f) Turbine trip bypassed.
- (g) Control hydraulics oil sump low.
- (h) Control hydraulics pump off.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION

CRITICALITY EVALUATION:

SHIP B NOTE #63 *****

FAILURE EFFECT: Throttle control.

SYSTEM EFFECT: Throttle control override.

SYMPTOM OR HOW DETECTED: Alarm V, BC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #64 *****

FAILURE EFFECT: Throttle control.

SYSTEM EFFECT: Shaft stopped overtime.

SYMPTOM OR HOW DETECTED: Alarm V, BC

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #65 *****

FAILURE EFFECT: Throttle control.

SYSTEM EFFECT: Throttle control out of service.

SYMPTOM OR HOW DETECTED: Alarm V, BC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #66 *****

FAILURE EFFECT: Throttle control.

SYSTEM EFFECT: Throttle control problem critical.

SYMPTOM OR HOW DETECTED: Alarm V, ECC (group).

- (a) Main engine tripped.
- (b) Astern gear valve failed to open timer--7 seconds after command.
- (c) Shaft stopped overtime (also BC). Timer--stopped over 2 minutes.
- (d) Control pump off. Sensor in hydraulic oil system.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #67 *****

FAILURE EFFECT: Turbine viax problem.

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED: Alarm V, ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #68 *****

FAILURE EFFECT: Turbine.

SYSTEM EFFECT: Wrong direction.

SYMPTOM OR HOW DETECTED: Alarm NV, ECC.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #69 *****

FAILURE EFFECT: Turbine tripped.

SYSTEM EFFECT:

SYMPTOM OR HOW DETECTED: Alarm V, ECC and BC (group).

- (a) Lube oil pressure low. Pressure switch.
- (b) Rotor axial motion trip.
- (c) Main condenser vacuum low-low PS-301, 18" Hg.
- (d) Manual trip.
- (e) Automatic shaft rollover malfunction.
- (f) Turbine overspeed sensor, 112% of max.
- (g) Throttle valve overtravel. Limit switch.
- (h) Lube oil gravity tank low. Gems LT 4'0 below top of tank.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION:

SHIP B NOTE #80

FAILURE EFFECT: Loss of control, combustion control.

SYSTEM EFFECT: No response to auto controls inputs.
Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Electronics = 9.4033
-Relays = 0.0890
Total = 9.4923

SHIP B NOTE #81 *****

FAILURE EFFECT: Poor air/fuel ratio.

POSSIBLE SYSTEM EFFECTS:

- (a) Smoke.
- (b) Incomplete combustion and possible explosion due to accumulation of unburned fuel.

SYMPTOM OR HOW DETECTED: Nonvital alarm, smoke alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE:

Effect (a): Verify alarm and check indicators for problems. If pressure indicator show low combustion air, activate remote manual. Continue at normal cruising speed.

Effect (b): Explosion, boiler down. Continue on one boiler at reduced capability.

-SECONDARY ACTION:

Effect (a): Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

Effect (b): Boiler probably down for rest of cruise. Proceed at reduced speed.

CRITICALITY EVALUATION: Based on most likely events.

81a--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

81a--Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable to during light-off.

81b--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: 61 - Not applicable to this phase.

81b--Mission Effects:

- (a) Normal Steaming: 7 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

81a: Electronics = 2.6166

81b: Electronics = 2.6166

SHIP B NOTE #82 *****

FAILURE EFFECT: Loss of remote manual.

SYSTEM EFFECT: Must resort to field manual operation if automatic control fails.

SYMPTOM OR HOW DETECTED: No response when remote manual activated.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually open and close field controlling components.

-SECONDARY ACTION: Troubleshoot system for loss of auto and remote control failure. Replace defective component and activate auto control.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 13 - Loss of back-up or alarm.
- (b) Maneuvering: 43 - Loss of back-up or alarm.
- (c) Light-Off: 73 - Loss of back-up or alarm.

Mission Effects:

- (a) Normal Steaming: 14 - Back-up failure, primary and back-up must both fail.
- (b) Maneuvering: 44 - Back-up failure, primary and back-up must both fail.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:
-Electronic = 1.8876

SHIP B NOTE #83 *****

FAILURE EFFECT: False alarm.

SYSTEM EFFECT: No effect.

SYMPTOM OR HOW DETECTED: Alarm sounds.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Crew checks indicators and control panel lights to verify alarms are false.

-SECONDARY ACTION: Troubleshoot to determine cause for false alarm and correct problem.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 14 - False alarm.
- (b) Maneuvering: 44 - False alarm.
- (c) Light-Off: 74 - False alarm.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 63 - Slight delay in light-off.

FAILURE RATE:
-Electronic = 17.655

SHIP B NOTE #84 *****

FAILURE EFFECT: Alarm fails to sound.

SYSTEM EFFECT: In most cases, the condition will degrade and boiler will trip.

SYMPTOM OR HOW DETECTED:

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine reason for trip and switch to remote manual for that function.

- ECONDARY ACTION: Troubleshoot reason for trip and failure of alarm to sound. Correct problem and restart boiler.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 13 - Loss of back-up or alarm.
- (b) Maneuvering: 43 - Loss of back-up or alarm.
- (c) Light-Off: 73 - Loss of back-up or alarm.

Mission Effects:

- (a) Normal Steaming: 14 - Back-up failure, primary and back-up must both fail.
- (b) Maneuvering: 44 - Back-up failure, primary and back-up must both fail.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

Electronic = 27.2208

SHIP B NOTE #85 *****

FAILURE EFFECT: Feedwater header pressure high.

SYSTEM EFFECT: High feedwater pressure, high drum level.

SYMPTOM OR HOW DETECTED:

- (a) Nonvital alarm for engine room control console.
Relief valve pops.
- (b) Turbine trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually operates pump.

-SECONDARY ACTION: Troubleshoot when time permits and replace defective component. Return to automatic control.

CRITICALITY EVALUATION:

85a--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote control.
- (b) Maneuvering: 33 - Alarm--activate remote control.
- (c) Light-Off: 63 - Alarm--activate remote control.

85a--Mission Effects:

- (a) Normal Steaming: 1 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 24 - Delay in light-off.

85b--System Effects:

- (a) Normal Steaming: 7 - Turbine trip--troubleshoot and restart turbine.
- (b) Maneuvering: 37 - Turbine trip--troubleshoot and restart turbine.
- (c) Light-Off: 67 - Turbine trip--troubleshoot and restart turbine.

85b--Mission Effects:

- (a) Normal Steaming: 10 - Temporary DIW.
- (b) Maneuvering: 40 - Temporary DIW.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

- Transducers = 12.64
- Electronics = 15.4650
- Total = 28.1050

SHIP B NOTE #86 *****

FAILURE EFFECT: Loss of control, drum level.

SYSTEM EFFECT: No response to auto controls inputs.
Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 72 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

-Transducers = 29.3
-Electronics = 14.1552
Total = 43.4552

SHIP B NOTE #87 *****

FAILURE EFFECT: Loss of control, feedpump control.

SYSTEM EFFECT: No response to auto controls inputs. Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 72 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

- Transducers = 12.64
- Electronics = 5.1044
- Total = 17.7444

SHIP B NOTE #88 *****

FAILURE EFFECT: Loss of control, superheated steam.

SYSTEM EFFECT: No response to auto controls inputs. Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to

the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 72 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

-Electronic = 11.5383
-Sensor = 1.1548
Total = 12.6931

SHIP B NOTE #89 *****

FAILURE EFFECT: Steam high pressure.

SYSTEM EFFECT: Rupture tubes and drum, steam explosion. No high pressure alarm or light. Have three relief valves back-up.

SYMPTOM OR HOW DETECTED: Pressure indicators.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Possibility that failure mode not immediately found due to back-up. Very low probability of all back-ups failing. Switch to remote manual control. If remote manual ineffective, activate manual control in field.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective

component and return to automatic control.

CRITICALITY EVALUATION:

- (a) Normal Steaming: No effect.
- (b) Maneuvering: No effect.
- (c) Light-Off: Failure mode not applicable to this phase.

SHIP B NOTE #90 *****

FAILURE EFFECT: Steam dump system inadvertently activates low steam.

SYSTEM EFFECT:

- (a) Turbine reduces RPM
- (b) Turbine reduces trips (at 775 to 650). Also reduces steam to electrical generators. Could have secondary failure due to low electrical power.

SYMPTOM OR HOW DETECTED: Pressure transmitter set at 830 PSI. Pressure indicator in engine room control console and boiler front. Lo pressure vital alarm for engine room control console and boiler front.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

90a--System Effects:

- (a) Normal Steaming: 8 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (b) Maneuvering: 38 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (c) Light-Off: 61 - Not applicable to this phase.

90a--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

90b--System Effects:

- (a) Normal Steaming: 7 - Turbine trip--troubleshoot and restart turbine.
- (b) Maneuvering: 37 - Turbine trip--troubleshoot and restart turbine.
- (c) Light-Off: 61 - Not applicable to this phase.

90b--Mission Effects:

- (a) Normal Steaming: 10 - Temporary DIW.
- (b) Maneuvering: 40 - Temporary DIW.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Transducers = 0.50
 -Electronics = 2.3957
 -Valves = 16.38
 Total = 19.2757

SHIP B NOTE #91 *****

FAILURE EFFECT: Loss of control of steam dump system.

SYSTEM EFFECT: No response to auto controls inputs.
 Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control

output is erratic when compared to known inputs. Use remote manual.

- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Electronic = 3.2479

SHIP '8 NOTE #92 *****

FAILURE EFFECT: Loss of control, deaerator.

SYSTEM EFFECT: No response to auto controls inputs. Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 72 - Erratic response--auto control output is erratic when compared to known inputs. Use remote

manual.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

-Electronics = 0.89385

SHIP B NOTE #93 *****

FAILURE EFFECT: Loss of control, fuel oil header temp.

SYSTEM EFFECT: No response to auto controls inputs.
Output varies.

SYMPTOM OR HOW DETECTED: Indicators show no response to inputs or erratic outputs.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate remote manual controls. Continue at normal cruising speed. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection.

CRITICALITY EVALUATION: Based on most likely events.

System Effects:

- (a) Normal Steaming: 12 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (b) Maneuvering: 42 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.
- (c) Light-Off: 72 - Erratic response--auto control output is erratic when compared to known inputs. Use remote manual.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.

(c) Light-Off: 23 - Slight delay in light-off.

FAILURE EFFECTS:

-Transducers = 1.1548
-Electronics = 0.89385
Total = 2.04865

SHIP 8 NOTE #94 *****

FAILURE EFFECT: Feedwater pump failure due to control system.

SYSTEM EFFECT: Low drum level.

SYMPTOM OR HOW DETECTED: Pressure sensor set at 800 PSI, vital alarm in engine room control console, light--run, standby, stop.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Back-up pump automatically activated. Pump not part of control system.

-SECONDARY ACTION: Crew would try repair failed pump.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 5 - Auto back-up--back-up takes over function.
- (b) Maneuvering: 35 - Auto back-up--back-up takes over function.
- (c) Light-Off: 65 - Auto back-up--back-up takes over function.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 22 - No effect.

FAILURE RATE:

-Electronics = 5.07978
-Switches = 9.84
Total = 14.91978

SHIP B NOTE #95 *****

FAILURE EFFECT: Loss of auto feedwater pump back-up.

MISSION EFFECT: Low drum level

SYMPTOM OR HOW DETECTED: Pressure sensor set at 850 PSIG, alarm for engine room control console and boiler front (separate pressure transmitter to control logic and engine room control console indicator redundant).

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. Manually start back-up pump.

-SECONDARY ACTION: Troubleshoot system. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 13 - Loss of back-up or alarm.
- (b) Maneuvering: 43 - Loss of back-up or alarm.
- (c) Light-Off: 53 - Loss of back-up or alarm.

Mission Effects:

- (a) Normal Steaming: 14 - Back-up failure, primary and back-up must both fail.
- (b) Maneuvering: 44 - Back-up failure, primary and back-up must both fail.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

-Switches = 15.02
-Electronics = 6.274925
Total = 21.294925

SHIP B NOTE #96 *****

FAILURE EFFECT: Loss of auto lube oil pump back-up.

SYSTEM EFFECT: Loss of auto switching for lube oil back-up.

SYMPTOM OR HOW DETECTED: Low lube oil pressure alarm. Lube oil gravity tank provides back-up when pressure is lost.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually switch on back-up pump.

-SECONDARY ACTION: Troubleshoot digital switching logic to determine cause of failure. Correct and switch to auto mode.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 13 - Loss of back-up or alarm.
- (b) Maneuvering: 43 - Loss of back-up or alarm.
- (c) Light-Off: 73 - Loss of back-up or alarm.

Mission Effects:

- (a) Normal Steaming: 14 - Back-up failure, primary and back-up must both fail.
- (b) Maneuvering: 44 - Back-up failure, primary and back-up must both fail.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

-Switches	= 18.68
-Electronics	= 5.6590
-Relays	= 0.5300
Total	= 24.8690

SHIP B NOTE #97 *****

FAILURE EFFECT: False turbine trip.

MISSION EFFECT: Turbine control valves shut.

SYMPTOM OR HOW DETECTED: Turbine tripped alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate handpump.

-SECONDARY ACTION: Troubleshoot system and switch back to primary modes when problem corrected.

CRITICALITY EVALUATION:

System Effects:

- (a) Normal Steaming: 10 - False turbine trip--troubleshoot and restart turbine.
- (b) Maneuvering: 40 - False turbine trip--troubleshoot and restart turbine.
- (c) Light-Off: 70 - False turbine trip--troubleshoot and restart turbine.

Mission Effects:

- (a) Normal Steaming: 10 - Temporary DIW.
- (b) Maneuvering: 40 - Temporary DIW.
- (c) Light-Off: 61 - Not applicable during light-off.

FAILURE RATE:

-Electronic	=	38.0858
-Valves	=	15.92
-Solenoids	=	14.02
-Relays	=	2.49
-Sensors	=	33.6
Total	=	104.1108

SHIP B NOTE #98 *****

FAILURE EFFECT: Loss of RPM control.

SYSTEM EFFECT: RPM not same as throttle control.

SYMPTOM OR HOW DETECTED: Erratic RPM.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate handpump.

-SECONDARY ACTION: Troubleshoot system and switch back to primary mode when problem corrected.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 18 - Erratic RPM's, turbine control failure, activate handpump.
- (b) Maneuvering: 48 - Erratic RPM's, turbine control failure, activate handpump.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 12 - Temporary loss of RPM control.
- (b) Maneuvering: 42 - Temporary loss of RPM control.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Electronics = 13.4186
-Sensors = 57.4000
Total = 70.8186

SHIP B NOTE #99 *****

FAILURE EFFECT: Loss of crash back.

SYSTEM EFFECT: Loss of direction control, possible collision.

SYMPTOM OR HOW DETECTED: No symptom, unless periodically tested.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Switch to handpump emergency mode and open aster. valve.

-SECONDARY ACTION: Troubleshoot system and switch back to primary mode when corrected.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 49 - Erratic directional control, turbine control failure, activate handpump.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 43 - Temporary loss of directional control.
- (c) Light-Off: 22 - Not applicable to this phase.

FAILURE RATE:

-Electronics = 1.0596
-Relays = 0.62
Total = 1.6796

SHIP B NOTE #100 *****

FAILURE EFFECT: Loss of direction control.

SYSTEM EFFECT: Loss of directional control.

SYMPTOM OR HOW DETECTED: Wrong direction alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Activate handpump.

-SECONDARY ACTION: Troubleshoot system and switch back to primary when problem corrected.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 48 - Erratic RPM's, turbine control failure, activate handpump.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 43 - Temporary loss of directional control.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Sensors = 57.4
-Electronics = 6.2598
Total = 63.6598

SHIP B NOTE #101 *****

FAILURE EFFECT: Loss of rate change.

SYSTEM EFFECT: Possible thermal stress damage due to sudden changes in steam flow to turbine.

SYMPTOM OR HOW DETECTED: Sudden changes in RPM, possible temporary low steam alarm when going from maneuvering to full ahead.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Throttle must be changed gradually.
-SECONDARY ACTION: Troubleshoot system and correct problem.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 11 - No alarm--only lightbar indicators show problem condition.
- (b) Maneuvering: 41 - No alarm--only lightbar indicators show problem condition.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 7 - Possible turbine damage.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Electronics = 5.8917
-Sensors = 57.4
Total = 63.2917

SHIP B NOTE #102 *****

FAILURE EFFECT: Turbine fails to trip.

MISSION EFFECT: Loss of RPM control.

SYMPTOM OR HOW DETECTED: Vessel tries to move when at stop.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually trip turbine.

-SECONDARY ACTION: Troubleshoot system and restore ARO when corrected.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 16 - Loss of trip.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 42 - Temporary loss of RPM control.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

- Sensors = 57.4
- Relays = 0.62
- Total = 58.02

SHIP B NOTE #103 *****

FAILURE EFFECT: Loss of turning gear back-up

SYSTEM EFFECT: Loss of back-up system.

SYMPTOM OR HOW DETECTED: Erratic RPM.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATELY: Manually trip turbine.

-SECONDARY ACTION: Dead in water until system repaired.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 13 - Loss of back-up or alarm.
- (b) Maneuvering: 43 - Loss of back-up or alarm.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 14 - Back-up failure, primary and back-up must both fail.
- (b) Maneuvering: 44 - Back-up failure, primary and back-up must both fail.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

- Switches = 3.43
- Relays = 0.31
- Total = 3.74

SHIP B NOTE #104 *****

FAILURE EFFECT: Loss of direction control.

SYSTEM EFFECT: Cannot activate astern turbine alarm.

SYMPTOM OR HOW DETECTED: Astern guard valve closed. Lamp on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually open guard valve.

-SECONDARY ACTION: Troubleshoot guard valve and restore automation function.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 49 - Erratic directional control, turbine

control failure, activate handpump.
(c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 43 - Temporary loss of directional control.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Valves = 19.21

SHIP B NOTE #105 *****

FAILURE EFFECT: Possible turbine damage.

SYSTEM EFFECT: Water could cause damage.

SYMPTOM OR HOW DETECTED: Vessel inspection.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually open valves.

-SECONDARY ACTION: Troubleshoot to determine why valve did not open automatically.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 80 - Loss of protective feature.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 66 - Possible turbine damage.

FAILURE RATE:

-Valves = 32.75

SHIP B NOTE #111 *****

FAILURE EFFECT: Loss of control due to hydraulic failure.

SYSTEM EFFECT: Loss of control both directional and RPM.

SYMPTOM OR HOW DETECTED: Pump failure lamp on if failure is due to low pressure. Erratic RPM of shaft.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Switch to handpump.

-SECONDARY ACTION: Troubleshoot hydraulic system.
Reactivate primary controls if problem resolved.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 18 - Erratic RPM's, turbine control failure, activate handpump.
- (b) Maneuvering: 48 - Erratic RPM's, turbine control failure, activate handpump.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 12 - Temporary loss of RPM control.
- (b) Maneuvering: 42 - Temporary loss of RPM control.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Motors	=	11.35
-Actuators	=	2.34
-Pumps	=	157.8086
-Valves	=	52.4000
-Switches	=	32.51
-LVDT	=	20.70
Total	=	277.1086

SHIP B NOTE #112 *****

FAILURE EFFECT: Loss of handpump capability.

SYSTEM EFFECT: Loss of back-up.

SYMPTOM OR HOW DETECTED: Erratic RPM of shaft.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Switch to handwheel control.

-SECONDARY ACTION: Troubleshoot hydraulic system. Restore primary mode if problem corrected.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 13 - Loss of back-up or alarm.
- (b) Maneuvering: 43 - Loss of back-up or alarm.
- (c) Light-Off: 61 - Not applicable to this phase.

Mission Effects:

- (a) Normal Steaming: 14 - Back-up failure, primary and back-up must both fail.
- (b) Maneuvering: 44 - Back-up failure, primary and back-up must both fail.
- (c) Light-Off: 21 - Not applicable during light-off.

SHIP B NOTE #113 *****

FAILURE EFFECT: 20-second timer times long.

SYSTEM EFFECT: Possible explosion.

SYMPTOM OR HOW DETECTED: All burner valves closed light does not come on after valve open for 5 seconds and no flame indication.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually trip burner.

-SECONDARY ACTION: Manually light burner. Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

-Electronics = 5.709825

SHIP 8 NOTE #114 *****

FAILURE EFFECT: Burner valve does not trip after open for 5 seconds and no flame detected.

SYSTEM EFFECT: Possible explosion.

SYMPTOM OR HOW DETECTED: All burner valve closed light does not come on after 5 seconds and no flame indication.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually trip burner.

-SECONDARY ACTION: Manually trip burner. Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

-Electronics = 5.169615

SHIP 8 NOTE # 115 *****

FAILURE EFFECT: Burner valve open more than 20 seconds after burner on initiated.

SYSTEM EFFECT: Possible explosion, could attempt light off with burner valve already open.

SYMPTOM OR HOW DETECTED: All burner valves closed light not on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Close burner valve manually.

-SECONDARY ACTION: Manually light off. Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

-Switches = 3.28
-Electronics = 0.16087
Total = 3.44087

SHIP 8 NOTE #116 *****

FAILURE EFFECT: Air register closes or cannot be opened.

SYSTEM EFFECT: Flame-out.

SYMPTOM OR HOW DETECTED: All air registers open light not on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually relight burner.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and re-start boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

116: Electronics = 0.712555

116a: Actuator = 8.62

SHIP 8 NOTE #117 *****

FAILURE EFFECT: Ignitor not withdrawn.

SYSTEM EFFECT: Possible explosion. Ignitor will burn up if burner on.

SYMPTOM OR HOW DETECTED: No indication, no light to show ignitor position.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually remove ignitor.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATES:

-Electronics = 3.049505

SHIP B NOTE #118 *****

FAILURE EFFECT: Air register opens or cannot be closed.

SYSTEM EFFECT: Prevents light-off.

SYMPTOM OR HOW DETECTED: Unsuccessful light-off attempt.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine reason for light-off failure.

-SECONDARY ACTION: Manually light burner and troubleshoot when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 77 - Light-off is inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 23 - Slight delay in light-off.

FAILURE RATE:

118: Electronics = 0.712555

118a: Actuator = 8.62

SHIP B NOTE #119 *****

FAILURE EFFECT: Burner valve closes or cannot be opened.

SYSTEM EFFECT: Burner shuts down.

SYMPTOM OR HOW DETECTED: Burner management problem alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine reason for burner shutdown.

-SECONDARY ACTION: Manually relight burner operating burner valve by hand.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

119: Electronics = 0.712555
Switches = 11.47
Total = 12.18255

119a: Valves = 16.38

SHIP B NOTE #120 *****

FAILURE EFFECT: Ignitor extended or cannot be withdrawn.

SYSTEM EFFECT: Possible explosion if F.O. or gases in shutdown boiler. Would burn up if boiler in operation. Burner valve would open immediately if light-off attempted and possible explosion. No light indicating ignitor extended.

SYMPTOM OR HOW DETECTED: No indication except light-off of sequence wrong. Burner valve opens immediately.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually shutdown burner. Withdraw ignitor.

-SECONDARY ACTION: Manually light burner using torch.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

120: Electronics = 0.69477

120a: Actuators = 8.62

SHIP B NOTE #121 *****

FAILURE EFFECT: Ignitor cannot be extended.

SYSTEM EFFECT: Unsuccessful light-off, burner shuts down.

SYMPTOM OR HOW DETECTED: No flame detector.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually light-off burner.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

121: Electronics = 0.69477
 Relays = 1.44
 Total = 2.13477

121a: Actuators = 8.62

SHIP B NOTE #122 *****

FAILURE EFFECT: False burner trip when burner valve and air register are open and flame is detected.

SYSTEM EFFECT: Burner shuts down.

SYMPTOM OR HOW DETECTED: Burner management problem alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE: Verify that all functions are within limits.
- SECONDARY ACTION: Restart boiler manually. Troubleshoot digital logic as time permits

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 17 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATES:

- Electronics = 14.8098
- Switches = 6.56
- Total = 21.3698

SHIP B NOTE #123 *****

FAILURE EFFECT: Burner valve opens or cannot be closed.

SYSTEM EFFECT: Possible explosion during light-off or during shutdown. Purge and light-off inhibited.

SYMPTOM OR HOW DETECTED: All burner valves closed light not on. No purge light.

MOST LIKELY ACTION AND SYSTEM STATUS

- IMMEDIATE: Manually operate burner valve.
- SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

123: Electronics = 0.712555

123a: Valves = 16.38

SHIP 8 NOTE #124 *****

FAILURE EFFECT: Burner fails to trip when air register closed.

SYSTEM EFFECT: Burner would probably flame out, no air register closed light.

SYMPTOM OR HOW DETECTED: Smoke or flame out alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine cause of flame out.

-SECONDARY ACTION: Manually re-light boiler and activate air register by hand. Troubleshoot as time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and re-start boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

- Electronics = 1.145125
- Switches = 3.29
- Total = 4.425125

SHIP B NOTE #125 *****

FAILURE EFFECT: Burner fails to trip on loss of flame.

SYSTEM EFFECT: Redundant logic would trip boiler.

SYMPTOM OR HOW DETECTED: Boiler trip alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine reason for loss of flame and correct.

-SECONDARY ACTION: Manually relight boiler and troubleshoot flame detection system when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 16 - Loss of trip.
- (b) Maneuvering: 46 - Loss of trip.
- (c) Light-Off: 76 - Loss of trip.

Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

- Electronic = 18.429255

SHIP 8 NOTE #126 *****

FAILURE EFFECT: Burner fails to trip when burner valve closed.

SYSTEM EFFECT: Unsuccessful burner shutdown logic will trip boiler. Burner will not light if it fails during light-off attempt.

SYMPTOM OR HOW DETECTED: Boiler trip alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Determine initial reason for closing of burner valve. Correct initial problem.

-SECONDARY ACTION: Manually restart boiler. Troubleshoot as time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 16 - Loss of trip.
- (b) Maneuvering: 46 - Loss of trip.
- (c) Light-Off: 76 - Loss of trip.

Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE EFFECTS:

- Electronics = 1.145125
- Switches = 3.28
- Total = 4.425125

SHIP 8 NOTE #127 *****

FAILURE EFFECT: FOTV closes or cannot be opened.

SYSTEM EFFECT: Shuts down boiler if in operation or cannot light off.

SYMPTOM OR HOW DETECTED: FOTV trip valve closed light on. Logic will not give trip alarm for this failure. Would get alarm for flame out or low steam pressure.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually open FOTV and manually relight boiler.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and re-start boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 9 - Large performance degradation.
- (b) Maneuvering: 39 - Large performance degradation.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATES:

127: Electronics = 8.671105

127a: Valves = 16.38

SHIP B NOTE #128 *****

FAILURE EFFECT: FOTV opens or cannot be closed.

SYSTEM EFFECT: FOTV remains opens, F.O. could enter shutdown boiler if burner valve also open. Inhibits light-off.

SYMPTOM OR HOW DETECTED: FOTV closed light not on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually close FOTV.

-SECONDARY ACTION: Troubleshoot to determine reason why valve not closed.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

128: Electronic = 1.252765

128a: Valves = 16.38

128b: Electronics = 0.39219

SHIP B NOTE #129 *****

FAILURE EFFECT: Flame detect logic failure. Will not close FOTV when no flame.

SYSTEM EFFECT: Boiler does not shut FOTV when flame out.

SYMPTOM OR HOW DETECTED: Burner shuts down. Burner management alarm.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Use manual trip to close FOTV. Determine reason for flame-out.

-SECONDARY ACTION: Restart boiler when reason for flame out corrected. Troubleshoot flame detection system.

CRITICALITY EVALUATION

Systems Effects:

- (a) Normal Steaming: 16 - Loss of trip.
- (b) Maneuvering: 46 - Loss of trip.
- (c) Light-Off: 76 - Loss of trip.

Missions Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 65 - Possible turbine damage.

FAILURE RATE:

-Electronics = 0.15050

SHIP B NOTE #130 *****

FAILURE EFFECT: Failure of trip logic, false trip.

SYSTEM EFFECT: Boiler shut down due to false trip.

SYMPTOM OR HOW DETECTED: Boiler trip and alarm. Indicated cause of trip within limits.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Open FOTV manually and relight burner manually.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

- (a) Normal Steaming: Temporary loss of one boiler, reduced RPM.
- (b) Maneuvering: Temporary loss of one boiler, reduced RPM.
- (c) Light-Off: Delay in light-off.

SHIP B NOTE #131 *****

FAILURE EFFECT: Loss of boiler trip.

SYSTEM EFFECT: Boiler does not trip for EM trip, water lo-lo, AF low, all BOVCL, oil press low, manual, flame, and boiler logic.

SYMPTOM OR HOW DETECTED: Alarm for hi/lo condition sounds but boiler fails to trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Try manual trip. If that fails, shut down burners, and manually shut FOTV.

-SECONDARY ACTION: Correct out of limit function and manually restart boiler. Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

Systems Effects:

- (a) Normal Steaming: 16 - Loss of trip.
- (b) Maneuvering: 46 - Loss of trip.
- (c) Light-Off: 76 - Loss of trip.

Missions Effects:

- (a) Normal Steaming: 7 - Possible turbine damage.
- (b) Maneuvering: 37 - Possible turbine damage.
- (c) Light-Off: 25 - Possible turbine damage.

FAILURE RATE:

-Electronics	=	1.740180
-Relays	=	0.229055
-Switches	=	23.78
Total	=	25.749235

SHIP B NOTE #132 *****

FAILURE EFFECT: Loss of purge time cycle (30 seconds). Fails to time or bypasses time and satisfactory air.

SYSTEM EFFECT: Possible explosion due to inadequate purge.

SYMPTOM OR HOW DETECTED: Purge complete light comes on immediately.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Increase air using remote manual. Purge for 30 seconds.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Possible turbine damage.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

-Electronics = 2.789045

SHIP B NOTE #133 *****

FAILURE EFFECT: Air register opened or cannot be closed.

SYSTEM EFFECT: Loss of light-off.

SYMPTOM OR HOW DETECTED: Ignitor does not extend, no burner light-off.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually close air register and light-off.

-SECONDARY ACTION: Troubleshoot digital logic when time

permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 24 - Delay in light-off.

SHIP B NOTE #134 *****

FAILURE EFFECT: Purge initiated--overrides all inhibits except air satisfactory. Could purge with low air pressure.

SYSTEM EFFECT: Possible explosion due to inadequate purges.

SYMPTOM OR HOW DETECTED: No air flow satisfactory light, FOTV open light.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Increase air using remote manual. Purge for 30 seconds.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability for explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.

- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible turbine damage.

FAILURE RATE:

-Electronic = 0.24418

SHIP B NOTE #135 *****

FAILURE EFFECT: Loss of purge--no air flow increase.

SYSTEM EFFECT: Possible explosion due to inadequate purge.

SYMPTOM OR HOW DETECTED: No purge in process light. FOTV light not on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Increase air using remote manual. Purge for 30 seconds.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive condition--actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible turbine damage.

FAILURE RATE:

-Electronics = 0.956735
-Relay = 0.0445
Total = 1.001235

SHIP B NOTE #136 *****

FAILURE EFFECT: Increase air flow to purge level.

SYSTEM EFFECT: Could blow out flame during low demand or light-off. Poor air/fuel ratio, smoke.

SYMPTOM OR HOW DETECTED: Boiler purge in process light on, loss of flame alarm, smoke alarm, combustion air indicator.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Switch to remote manual control and reduce air flow.

-SECONDARY ACTION: Troubleshoot when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and re-start boiler.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

-Electronics = 0.956735

SHIP B NOTE #137 *****

FAILURE EFFECT: Decrease air flow to light-off level.

POSSIBLE SYSTEM EFFECTS:

- (a) Black smoke, poor air/fuel ratio.
- (b) Incomplete combustion and possible explosion due to accumulation of unburned fuel.
- (c) Low steam pressure.
- (d) Boiler trip at 0.1 WC.

SYMPTOM OR HOW DETECTED: Nonvital alarm. Pressure transmitter set at 0.1 W.C. Pressure indicator at boiler front. Alarm and indicators in engine room control console.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE:

Effect (a): Verify alarm (smoke or low air) and check indicators for problems. If pressure indicator show low combustion air, activate remote manual. Continue at normal cruising speed.

Effect (b): Explosion, boiler down. Continue on one boiler at reduced capability.

Effect (c): Check indicators and annunciator for reason for trip. Continue on one boiler at reduced capability.

-SECONDARY ACTION:

Effect (a): Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

Effect (b): Boiler probably down for rest of cruise. Proceed at reduced speed.

Effect (a): Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

CRITICALITY EVALUATION: Based on most likely events.

137a--System Effects:

(a) Normal Steaming: 3 - Alarm--activate remote manual.

(b) Maneuvering: 33 - Alarm--activate remote manual.

(c) Light-Off: 61 - Not applicable to this phase.

137a--Mission Effects:

(a) Normal Steaming: 3 - Slight performance degradation.

(b) Maneuvering: 33 - Slight performance degradation.

(c) Light-Off: 21 - Not applicable during light-off.

137b--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: 61 - Not applicable to this phase.

137b--Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

137c--System Effects:

- (a) Normal Steaming: 8 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (b) Maneuvering: 38 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (c) Light-Off: 61 - Not applicable to this phase.

137c--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

137d--System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and restart boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and restart boiler.
- (c) Light-Off: 61 - Not applicable to this phase.

137d--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Electronics = 0.72541
 -Switches = 11.47
 Total = 12.19541

SHIP B NOTE #138 *****

FAILURE EFFECT: Air flow not decreased when boiler pressure low.

SYSTEM EFFECT: Low pressure inceases demand signal.
 Possible boiler thermal damage of cold boiler. F.O. rate

increases too rapidly.

SYMPTOM OR HOW DETECTED: Low air flow light not on, air flow indicator shows low air.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Switch to remote manual control and reduce demand signal.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 80 - Loss of protective feature.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

- Electronic = 0.72541
- Switches = 11.47
- Total = 12.19541

SHIP B NOTE #139 *****

FAILURE EFFECT: Decrease F.O. flow to light-off level.

SYSTEM EFFECT:

- (a) Low steam pressure.
- (b) Possible flame-out.

SYMPTOM OR HOW DETECTED: No alarm or indicator--would get alarms from lo steam pressure. Could get turbine run back or trip.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators in control console. If cannot clear alarm, activate remote manual or manual control.

-SECONDARY ACTION: Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and return to automatic control.

CRITICALITY EVALUATION:

139a--System Effects:

- (a) Normal Steaming: 8 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (b) Maneuvering: 38 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (c) Light-Off: 61 - Not applicable to this phase.

139a--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 5 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

139b--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 3 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

139b--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 5 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

-Electronic = 0.56454

SKIP B NOTE #140 *****

FAILURE EFFECT: Recirculate F.O. with FOTV closed.

SYSTEM EFFECT: F.O. temperature in pipes to boiler remain cold. Boiler fails to light-off.

SYMPTOM OR HOW DETECTED: FOTV closed light on. Cannot

light boiler.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Manually open FOTV.

-SECONDARY ACTION: Troubleshoot digital logic when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 77 - Light-off inhibited or aborted.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 24 - Delay in light-off.

FAILURE RATE:

-Electronic = 1.56454
-Relay = 0.91
Total = 1.47454

SHIP B NOTE #141 *****

FAILURE EFFECT: Recirculate with inhibits suppressed.
Opens FOTV and recirculation valve.

SYSTEM EFFECT: F.O. could enter boiler if burner valve open, possible explosion.

SYMPTOM OR HOW DETECTED: Burner valve open and F.O.
recirculation light on.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Shut down recirculation. Ensure all inhibit conditions met by checking lights.

-SECONDARY ACTION: Troubleshoot when time permits.

CRITICALITY EVALUATION

System Effects:

- (a) Normal Steaming: 1 - Not applicable to this phase.
- (b) Maneuvering: 31 - Not applicable to this phase.
- (c) Light-Off: 66 - Explosive conditions -- actual probability of explosion depends on other factors.

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 31 - Not applicable during maneuvering.
- (c) Light-Off: 25 - Possible boiler damage.

FAILURE RATE:

- Electronics = 0.11395

SHIP B NOTE #142 *****

FAILURE EFFECT: High combustion air (poor air/fuel ratio)

SYSTEM EFFECT:

- (a) Excessive smoke--white.
- (b) Could blow out flame at low fuel demand.
- (c) Low steam pressure.

SYMPTOM OR HOW DETECTED: Pressure indicator on boiler front. No alarm for high air. There is alarm for boiler smoke. Burner will trip if flame is blown out and burner management problem alarm sounds. Boiler trip if both burners flame out.

MOST LIKELY ACTION AND SYSTEM STATUS

-IMMEDIATE: Verify alarm and check indicators to determine problem. If pressure indicator shows high combustion air, activate remote manual controls or switch fan to low speed. Continue at normal cruising speed. For burner trip, check indicators and annunciator for reason for trip. Proceed at reduced capability.

-SECONDARY ACTION: Troubleshoot system using analog circuit analyzer. Replace defective card. If not electronic failure, would have to isolate to the field components using meters and visual inspection. Damper could be manually positioned if remote manual not functioning properly.

CRITICALITY EVALUATION: Based on most likely events.

1a--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

1a--Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

1b--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable to this phase.

1b--Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

1c--System Effects:

- (a) Normal Steaming: 8 - Turbine reduces RPM--troubleshoot and resume normal RPM's.
- (b) Maneuvering: 38 - Turbine reduces RPM--troubleshoot and resume normal RPM's.
- (c) Light-Off: 61 - Not applicable to this phase.

1c--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

1a: Transducers = 6.8400
Relays = 0.0178
Controllers = 0.7360
Actuators = 3.4480
Electronics = 13.6985
Total = 24.7403

1b: Transducers = 5.1300
Relays = 0.0133
Controllers = 1.8400
Actuators = 0.8620
Electronics = 8.7319
Total = 16.5772

1c: Transducers = 5.1300
Relays = 0.0133
Controllers = 0.3680

Actuators = 1.7240
Electronics = 8.2072
Total = 15.4425

ld: Electronics = 0.9884
Controllers = 0.5520
Actuators = 2.5860
Total = 4.1264

SHIP B NOTE #143 *****

FAILURE EFFECT: Low combustion air.

POSSIBLE SYSTEM EFFECTS:

- (a) Black smoke, poor air/fuel ratio.
- (b) Incomplete combustion and possible explosion due to accumulation of unburned fuel.
- (c) Low steam pressure.
- (d) Boiler trip at 0.1 WC.

SYMPTOM OR HOW DETECTED: Nonvital alarm. Pressure transmitter set at 0.1 W.C. Pressure indicator at boiler front. Alarm and indicators in engine room control console.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE:

Effect (a): Verify alarm (smoke or low air) and check indicators for problems. If pressure indicator show low combustion air, activate remote manual. Continue at normal cruising speed.

Effect (b): Explosion, boiler down. Continue on one boiler at reduced capability.

Effect (c): Check indicators and annunciator for reason for trip. Continue on one boiler at reduced capability.

-SECONDARY ACTION:

Effect (a): Verify alarm and check indicators in control console. Switch to remote manual control. If remote manual ineffective, activate manual control of function. Proceed with slightly degraded capabilities.

Effect (b): Boiler probably down for rest of cruise.
Proceed at reduced speed.

Effect (a): Troubleshoot system using analog test station. If problem in the field, isolate to component using meters and visual inspection. Replace defective component and restart boiler.

CRITICALITY EVALUATION: Based on most likely events.

3a--System Effects:

- (a) Normal Steaming: 3 - Alarm--activate remote manual.
- (b) Maneuvering: 33 - Alarm--activate remote manual.
- (c) Light-Off: 61 - Not applicable during this phase.

3a--Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 33 - Slight performance degradation.
- (c) Light-Off: 21 - Not applicable during light-off.

3b--System Effects:

- (a) Normal Steaming: 6 - Explosive condition--actual probability of explosion depends on other factors.
- (b) Maneuvering: 36 - Explosive condition--actual probability of explosion depends on other factors.
- (c) Light-Off: Not applicable during this phase.

3b--Mission Effects:

- (a) Normal Steaming: 8 - Possible boiler damage.
- (b) Maneuvering: 38 - Possible boiler damage.
- (c) Light-Off: 21 - Not applicable during light-off.

3c--System Effects:

- (a) Normal Steaming: 8 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (b) Maneuvering: 38 - Turbine MPC reduces RPM--troubleshoot and resume normal RPM's.
- (c) Light-Off: 61 - Not applicable during this phase.

3c--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

3d--System Effects:

- (a) Normal Steaming: 4 - Boiler trip--troubleshoot and restart boiler.
- (b) Maneuvering: 34 - Boiler trip--troubleshoot and restart boiler.
- (c) Light-Off: 61 - Not applicable during this phase.

3d--Mission Effects:

- (a) Normal Steaming: 5 - Temporary reduced RPM's.
- (b) Maneuvering: 35 - Temporary reduced RPM's.
- (c) Light-Off: 21 - Not applicable during light-off.

FAILURE RATE:

3a: Transducers = 13.9840
Controllers = 0.5840
Actuators = 3.4480
Electronics = 17.6866
Total = 35.7026

3b: Transducers = 3.4961
Controllers = 0.1450
Actuators = 0.8620
Electronics = 5.7821
Total = 10.2862

3c: Electronics = 2.0858
Controllers = 0.2920
Actuators = 1.7240
Total = 4.1018

3d: Electronics = 3.1286
Controllers = 2.4380
Actuators = 2.5860
Total = 6.1526

SHIP C NOTE #1 *****

FAILURE EFFECT: Propulsion system goes to idle.

SYSTEM EFFECT: Lose way on vessel.

SYMPTOM OR HOW DETECTED: Bridge/Engine room RPM indicators.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Attempt to restore propulsion; go to manual operation.

-SECONDARY ACTION: Troubleshoot, repair; restore system to auto mode.

CRITICALITY EVALUATION

Mission Effects:

(a) Normal Steaming: 6 - Dead in the water.

(b) Maneuvering: 36 - Dead in the water.

SHIP C NOTE #2 *****

FAILURE EFFECT: Lose control capability at 1 or more control stations.

SYSTEM EFFECT: No effect.

SYMPTOM OR HOW DETECTED: Station in control indicators.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Attempt to determine nature of problem; transfer control to another station.

-SECONDARY ACTION: Troubleshoot, repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.

SHIP C NOTE #3 *****

FAILURE EFFECT: Incorrect transfer of station in control.

SYSTEM EFFECT: No effect.

SYMPTOM OR HOW DETECTED: Station in control indicators.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Attempt to determine nature of problem;
transfer control to another station.

-SECONDARY ACTION: Troubleshoot, repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.

SHIP C NOTE #4 *****

FAILURE EFFECT: No station in control transfers possible.

SYSTEM EFFECT: No effect.

SYMPTOM OR HOW DETECTED: Station in control indicators.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Leave control at existing station until
problem resolved.

-SECONDARY ACTION: Troubleshoot, repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.

SHIP C NOTE #5 *****

FAILURE EFFECT: Incorrect station-in-control indicators.

SYSTEM EFFECT: None unless crew takes wrong action.

SYMPTOM OR HOW DETECTED: No direct indications; nature of problem would have to be identified through voice communication.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Leave control at existing station until problem resolved.

-SECONDARY ACTION: Troubleshoot, repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.

SHIP C NOTE #6 *****

FAILURE EFFECT: 1 engine shutdown or de-clutches.

SYSTEM EFFECT: Vessel thrust reduction.

SYMPTOM OR HOW DETECTED: Bridge/engine room RPM indicators; engine stop annunciator.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Attempt to bring engine back on line; go to manual operation.

-SECONDARY ACTION: Troubleshoot, repair; restore system to auto mode.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 35 - Large performance degradation.

SHIP C NOTE #7 *****

FAILURE EFFECT: Lose engine/clutch protective shutdowns on or inhibits.

SYSTEM EFFECT: Engine/clutch damage if condition protected against occurs.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: No effect and no action if forbidden condition does not occur.

-SECONDARY ACTION: If forbidden condition occurs, major repair/restoration required.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 7 - Possible equipment damage.
- (b) Maneuvering: 37 - Possible equipment damage.

SHIP C NOTE #8 *****

FAILURE EFFECT: Engine cannot be started or clutched-in.

SYSTEM EFFECT: Full thrust not available.

SYMPTOM OR HOW DETECTED: Bridge/engine room RPM indicators, engine start annunciator.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Attempt re-start or clutch-in; go to manual operation.

-SECONDARY ACTION: Troubleshoot, repair; restore system to auto mode.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 35 - Large performance degradation.

SHIP C NOTE #9 *****

FAILURE EFFECT: 1 engine starts spontaneously.

SYSTEM EFFECT: None.

SYMPTOM OR HOW DETECTED: Bridge/engine room RPM indicators.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Stop engine via stop switch.

-SECONDARY ACTION: Troubleshoot, repair.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 32 - No effect.

SHIP C NOTE #10 *****

FAILURE EFFECT: Lose split mode.

SYSTEM EFFECT: None.

SYMPTOM OR HOW DETECTED: No direct indication.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Verify split mode operation not possible; go to another mode manual-local operation.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION:

Mission Effects:

(a) Normal Steaming: 2 - No effect.

(b) Maneuvering: 33 - Slight performance degradation.

SHIP C NOTE #11 *****

FAILURE EFFECT: Incorrect visual indication/annunciator.

SYSTEM EFFECT: Crew receives incorrect status information.

SYMPTOM OR HOW DETECTED: No direct indication.

MOST LIKELY ACTION AND SYSTEM STATUS: Indeterminant.

-IMMEDIATE:

-SECONDARY ACTION:

CRITICALITY EVALUATION

Mission Effects:

(a) Normal Steaming: 3 - Slight performance degradation.

(b) Maneuvering: 33 - Slight performance degradation.

SHIP C NOTE #12 *****

FAILURE EFFECT: Lose pitch control when going AH.

SYSTEM EFFECT: Loss of speed/direction change control.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

(a) Normal Steaming: 8 - Incorrect response to speed/direction change commands.

(b) Maneuvering: 38 - Incorrect response to speed/direction change commands.

SHIP C NOTE #13 *****

FAILURE EFFECT: Lose pitch control when going AS.

SYSTEM EFFECT: Loss of speed/direction change control.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION:

Mission Effects:

(a) Normal Steaming: 8 - Incorrect response to speed/direction change commands.

(b) Maneuvering: 38 - Incorrect response to speed/direction change commands.

SHIP C NOTE #14 *****

FAILURE EFFECT: False full AH or AS commands.

SYSTEM EFFECT: Vessel out of control.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

14a

(a) Normal Steaming: 2 - No effect.

(b) Maneuvering: 39 - Uncommanded speed/direction changes.

14b

(a) Normal Steaming: 9 - Uncommanded speed/direction changes.

(b) Maneuvering: 32 - No effect.

SHIP C NOTE #15 *****

FAILURE EFFECT: Uncommanded speed increases.

SYSTEM EFFECT: Vessel out of control.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 9 - Uncommanded speed/direction changes.
- (b) Maneuvering: 9 - Uncommanded speed/direction changes.

SHIP C NOTE #16 *****

FAILURE EFFECT: Speed higher/lower than commanded.

SYSTEM EFFECT: Vessel out of control.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

- IMMEDIATE: Go to manual pitch control.
- SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 9 - Uncommanded speed/direction changes.
- (b) Maneuvering: 9 - Uncommanded speed/direction changes.

SHIP C NOTE #17 *****

FAILURE EFFECT: Lose speed/direction control in maneuver mode.

SYSTEM EFFECT: No vessel control in maneuver mode.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION:

Mission Effects:

- (a) Normal Steaming: 2 - No effect.
- (b) Maneuvering: 38 - Incorrect response to speed/direction change commands.

SHIP C NOTE #18 *****

FAILURE EFFECT: Lose speed/direction control in cruise mode.

SYSTEM EFFECT: No vessel control in cruise mode.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 8 - Incorrect response to speed/direction change commands.
- (b) Maneuvering: 32 - No effect.

SHIP C NOTE #19 *****

FAILURE EFFECT: Lose speed/direction control in any auto mode.

SYSTEM EFFECT: No vessel control in any auto mode.

MOST LIKELY ACTION AND SYSTEM STATUS:

- IMMEDIATE: Go to manual pitch control.
- SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 8 - Incorrect response to speed/direction change commands.
- (b) Maneuvering: 8 - Incorrect response to speed/direction change commands.

SHIP C NOTE #20 *****

FAILURE EFFECT: Lose speed control of 1 engine.

SYSTEM EFFECT: Available thrust not as expected.

SYMPTOM OR HOW DETECTED: Engine RPM indicators.

MOST LIKELY ACTION AND SYSTEM STATUS:

- IMMEDIATE: Go to manual control.
- SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 3 - Slight performance degradation.
- (b) Maneuvering: 35 - Large performance degradation.

SHIP C NOTE #21 *****

FAILURE EFFECT: Erroneous speed/direction commands when vessel not underway.

SYSTEM EFFECT: Possible damage at dock.

SYMPTOM OR HOW DETECTED: Would be obvious from vessel response.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION:

Mission Effects:

(a) Normal Steaming: 1 - Not applicable during normal steaming.

(b) Maneuvering: 31 - Not applicable during maneuvering.

SHIP C NOTE #22 *****

FAILURE EFFECT: Incorrect change rates for pitch/engine commands.

SYSTEM EFFECT: Engine/CPM could be stressed.

SYMPTOM OR HOW DETECTED: Not directly obvious.

MOST LIKELY ACTION AND SYSTEM STATUS:

-IMMEDIATE: Go to manual pitch control.

-SECONDARY: Troubleshoot and repair.

CRITICALITY EVALUATION:

Mission Effects:

(a) Normal Steaming: 1 - Not applicable during normal steaming.

(b) Maneuvering: 37 - Possible equipment damage.

SHIP C NOTE #23 *****

FAILURE EFFECT: Lose ability to go AH or AG.

SYSTEM EFFECT: Lose directional control.

MOST LIKELY ACTION AND SYSTEM STATUS:

- IMMEDIATE: Go to manual pitch control.
- SECONDARY ACTION: Troubleshoot and repair.

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 8 - Incorrect response to speed/direction change commands.
- (b) Maneuvering: 38 - Incorrect response to speed/direction change commands.

SHIP C NOTE #24 *****

FAILURE EFFECT: Crash astern rates inhibited.

SYSTEM EFFECT: Crash astern maneuvers too slow.

SYMPTOM OR HOW DETECTED: Not directly.

MOST LIKELY ACTION AND SYSTEM STATUS: Dependent on reason why crash astern.

-IMMEDIATE:

-SECONDARY:

CRITICALITY EVALUATION

Mission Effects:

- (a) Normal Steaming: 1 - Not applicable during normal steaming.
- (b) Maneuvering: 38 - Incorrect response to speed/direction change commands.

APPENDIX G
PREDICTOR CRITICALITY PRINT-OUTS

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*Premature Failure Rates.

G-1

BLACK PARTS	U.C.	QTY	FUNCTION FAILURE PROB.	FAIL. MODE PROB.	FAIL. MODE PROB.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
1	FUNCTION ELECTRONIC/ARM NOT SET	1.00	2	130.1002				
MODE1	MODE=LOSS OF PURGE	1	130.1002	0.09	.07410-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=INADVERTENT PURGE	1	130.1002	0.01	.00450-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LIGHT-OFF LOGIC FAILURE	1	130.1002	0.21	.02020-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS OF TRIP	1	130.1002	0.07	.01300-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=INADVERTENT PURGE	1	130.1002	0.01	.00400-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS/INADEQUATE RECR	1	130.1002	0.06	.00470-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=FALSE TRIP	1	130.1002	0.11	.01020-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=FOV CLOSED OR CANT OPEN	1	130.1002	0.12	.01090-01	SLW TRIP/CORRECT/RESTART SLW	0.000	.00370-02
	MODE=FOV CLOSED OR CANT OPEN	1	130.1002	0.12	.01090-01	SLW TRIP/CORRECT/RESTART SLW	0.000	.00370-02
	MODE=FOV OPEN OR CANT CLOSE	1	130.1002	0.00	.00000-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=FOV OPEN OR CANT CLOSE	1	130.1002	0.00	.00000-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=FOV OPEN OR CANT CLOSE	1	130.1002	0.00	.00000-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS OF BOILER TRIP	1	130.1002	0.02	.00520-02	LOSS OF TRIP	0.500	.11700-02
	MODE=LOSS OF PURGE TIMER	1	130.1002	0.04	.00170-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=PURGE INITIATED/NO INHIB	1	130.1002	0.00	.00000-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=AIR FLOW TO PURGE LEVEL	1	130.1002	0.01	.00170-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=NO FLD LYOFF LVL/LOW DTH	1	130.1002	0.01	.00170-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.13730-03
	MODE=NO FLD LYOFF LVL/NO FLAME	1	130.1002	0.00	.00000-03	NPL REDUCED RPM/CORRECT/REDUCE	0.000	.15400-03
	MODE=NO RECR WITH FOTV LANSFO	1	130.1002	0.02	.00400-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=NO RECR WITH INHIB SUPPRESSO	1	130.1002	0.00	.00000-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLACK PARTS	1	FUNCTION SWITCHES	1.00	2	70.0200			
MODE1	MODE=LOSS OF PURGE	1	70.0200	0.11	.52730-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS OF TRIP	1	70.0200	0.09	.00420-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS/INADEQUATE RECR	1	70.0200	0.13	.00470-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS OF BOILER TRIP	1	70.0200	0.07	.03220-01	LOSS OF TRIP	0.500	.16410-01
BLACK PARTS	1	FUNCTION RELAYS	1.00	2	2.3000			
MODE1	MODE=LOSS OF PURGE	1	2.3000	0.00	.00000-05	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=FALSE TRIP	1	2.3000	0.01	.00000-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=LOSS OF BOILER TRIP	1	2.3000	0.20	.00000-03	LOSS OF TRIP	0.500	.16200-03
	MODE=NO RECR WITH FOTV CLOSED	1	2.3000	0.70	.12000-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLACK PARTS	1	FUNCTION VALVES	1.00	2	131.0000			
MODE1	MODE=LOSS/INADEQUATE PURGE	1	131.0000	0.50	.05050-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
	MODE=FOV CLOSED OR CANT OPEN	1	131.0000	0.25	.02050-01	SLW TRIP/CORRECT/RESTART SLW	0.000	.01000-02
	MODE=FOV OPEN OR CANT CLOSE	1	131.0000	0.25	.02050-01	NOT APPLICABLE TO THIS PHASE	0.0	.0

		D.C.	QTY	FUNCTION FAILURE PROB. PNT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	2	FUNCTION ELECTRONIC/BNR MODULE	1.00	4	270.6850				
MODE:		MODE=BNR LTOFF LOGIC FAILS	1	270.6850	0.02	.44820-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=IGNITOR FAILURE		270.6850	0.06	.10870-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FALSE TRIP		270.6850	0.07	.12790-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF TRIP		270.6850	0.02	.38560-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FLAME INDICATOR PROBLEM		270.6850	0.01	.15140-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=20 SEC TIMER/TIMER LONG		270.6850	0.08	.16610-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=BNR VLV 5 SEC SHUTDN FAIL		270.6850	0.08	.14500-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=BNR VLV 24 SEC SHUTDN FAIL		270.6850	0.05	.07540-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=AR CLOSBS OR CANT OPEN		270.6850	0.01	.19200-02	BLR TRIP/CORRECT/RESTART BLR	0.000	.76000-03
		MODE=IGNITOR NOT WITHDRAWN		270.6850	0.05	.08620-02	NO EFFECT	0.0	.0
		MODE=BNR OPENS OR CANT CLOSE		270.6850	0.01	.19200-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=BNR VLV CLOSBS/CANT OPEN		270.6850	0.01	.19200-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.19200-03
		MODE=IGNITOR EXTENDED		270.6850	0.01	.19200-02	NO EFFECT	0.0	.0
		MODE=IGNITOR CANT BE EXTENDED		270.6850	0.01	.19200-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FALSE BURNER TRIP		270.6850	0.20	.37520-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.37520-02
		MODE=BNR VLV OPENS/CANT CLOSE		270.6850	0.01	.19200-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=BNR FAILS TO TRIP/AR CLOS		270.6850	0.02	.34530-02	BLR TRIP/CORRECT/RESTART BLR	0.000	.13810-02
		MODE=BNR FAILS TO TRIP/NO FLAME		270.6850	0.27	.51110-01	LOSS OF TRIP	0.500	.25560-01
		MODE=BNR FAILS TO TRIP/BNR CLS		270.6850	0.02	.32620-02	LOSS OF TRIP	0.500	.16310-02
BLOCK PARTS	2	FUNCTION SWITCHES	1.00	4	186.6424				
MODE:		MODE=IGNITOR FAILURE	1	186.6424	0.10	.18510-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF TRIP		186.6424	0.26	.34120-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=BNR VLV 24 SEC SHUTDN FAIL		186.6424	0.07	.02530-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=BNR VLV CLOSBS/CANT OPEN		186.6424	0.25	.32670-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.32070-02
		MODE=FALSE BNR TRIP		186.6424	0.14	.18510-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.18510-02
		MODE=BNR FAILS TO TRIP/AR CLOS		186.6424	0.07	.02530-02	BLR TRIP/CORRECT/RESTART BLR	0.000	.16930-02
		MODE=BNR FAILS TO TRIP/BNR CLS		186.6424	0.07	.02530-02	LOSS OF TRIP	0.500	.06170-02
BLOCK PARTS	2	FUNCTION VALVES	1.00	4	131.0400				
MODE:		MODE=BNR VLV CLOSBS/CANT OPEN	1	131.0400	0.50	.45450-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.45450-02
		MODE=BNR VLV OPENS/CANT CLOSE		131.0400	0.50	.45450-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION RELAYS	1.00	4	17.2400				
MODE:		MODE=BNR LTOFF LOGIC FAILS	1	17.2400	0.33	.40800-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=IGNITOR FAILURE		17.2400	0.12	.14800-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF TRIP		17.2400	0.21	.25790-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=IGNITOR CANT BE EXTENDED		17.2400	0.33	.40800-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION TRANSFORMERS	1.00	4	0.1600				
MODE:		MODE=IGNITOR FAILURE	1	0.1600	1.00	.11560-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION ACTUATORS	1.00	4	137.9200				
MODE:		MODE=AR CLOSBS OR CANT OPEN	1	137.9200	0.25	.24180-01	BLR TRIP/CORRECT/RESTART BLR	0.000	.04730-02
		MODE=AR OPENS OR CANT CLOSE		137.9200	0.25	.24180-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=IGNITOR EXTENDED		137.9200	0.25	.24180-01	NO EFFECT	0.0	.0
		MODE=IGNITOR CANT BE EXTENDED		137.9200	0.25	.24180-01	NOT APPLICABLE TO THIS PHASE	0.0	.0

		D.C.	QTY	FUNCTION FAILURE PROR.	FAIL. MODE FREQ.	FAIL. MODE FREQ.	SYSTEM EFFECT	MISSION LOSS PROR.	MISSION CRITICALITY (C)
3	FUNCTION ELECTRONIC/CONRUST CNTL CLR DMD LO								
BLOCK PARTS		1.00	1	63.6739					
MODE:	MODE=LOW STM PRES		1	63.6739	0.32	.14540-01	MPC REDUCES RPM/CORRECT/RESUME	0.400	.54100-02
	MODE=HI STM PRES/STH DUMP ACT			63.6739	0.14	.63690-02	AUTO BACK-UP TAKES OVER	0.0	.0
	MODE=HI STM PRES/RIPTURE TIME			63.6739	0.14	.63690-02	EXPLOSIVE CONDITION	0.500	.31550-02
	MODE=FALSE ALARM			63.6739	0.19	.03290-02	FALSE ALARM	0.0	.0
	MODE=ALARM FAIL			63.6739	0.19	.03290-02	LOSS OF BACK-UP ON ALARM	0.200	.16440-02
	MODE=FALSE TURNTIME TRIP			63.6739	0.03	.11750-02	FALSE TURNTIME TRIP/CORRECT/RESTART	0.700	.02230-03
3	FUNCTION TRANSDUCERS								
BLOCK PARTS		1.00	1	73.5200					
MODE:	MODE=LOW STM PRES		1	73.5200	0.50	.25760-01	MPC REDUCES RPM/CORRECT/RESUME	0.400	.10500-01
	MODE=HI STM PRES/STH DUMP ACT			73.5200	0.25	.12970-01	AUTO BACK-UP TAKES OVER	0.0	.0
	MODE=HI STM PRES/RIPTURE TIME			73.5200	0.25	.12970-01	EXPLOSIVE CONDITION	0.500	.64430-02
4	FUNCTION ELECTRONIC/CONRUST CNTL								
BLOCK PARTS		1.00	2	200.9304					
MODE:	MODE=LOW FO FLOW/LOW STM PRES		1	200.9304	0.04	.05230-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.05230-03
	MODE=LOW FO FLOW/FLAME OUT			200.9304	0.04	.50400-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.22760-02
	MODE=HI FO FLOW/SMOKE			200.9304	0.08	.10780-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.10780-02
	MODE=HI FO FLOW/MI STM PRES			200.9304	0.04	.55490-02	NO EFFECT	0.0	.0
	MODE=HI FO FLOW/EXCBV FO			200.9304	0.02	.22600-02	EXPLOSIVE CONDITION	0.500	.11440-02
	MODE=LOW STM PRES			200.9304	0.01	.11410-02	MPC REDUCES RPM/CORRECT/RESUME	0.000	.45630-03
	MODE=HI STM PRES/STH DUMP ACT			200.9304	0.01	.11410-02	AUTO BACK-UP TAKES OVER	0.0	.0
	MODE=HI STM PRES/RIPTURE TIME			200.9304	0.00	.14270-03	EXPLOSIVE CONDITION	0.500	.71330-04
	MODE=LOSS OF CONTROL/COMM CNTL			200.9304	0.00	.13100-01	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.13100-02
	MODE=POOR AIR/FO RATIO/SMOKE			200.9304	0.03	.37620-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.37620-03
	MODE=POOR AIR/FO /EXCBV FO			200.9304	0.03	.37620-02	EXPLOSIVE CONDITION	0.500	.10510-02
	MODE=LOSS OF REMOTE MANUAL			200.9304	0.01	.09420-03	LOSS OF BACK-UP ON ALARM	0.200	.14960-03
	MODE=HI CONRUST AIR/SMOKE			200.9304	0.14	.19220-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.19220-02
	MODE=HI CONRUST AIR/FLAME OUT			200.9304	0.04	.12340-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12340-02
	MODE=HI CONRUST AIR/LOW STEAM			200.9304	0.00	.11630-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.11630-03
	MODE=HI CONRUST AIR/SMOKE			200.9304	0.01	.14260-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.14260-03
	MODE=LOW CONRUST AIR/EXCBV FO			200.9304	0.10	.24800-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.24800-02
	MODE=LOW CONRUST AIR/LOW STEAM			200.9304	0.06	.08940-02	EXPLOSIVE CONDITION	0.500	.08940-02
	MODE=LOW CONRUST AIR/CLR TRIP			200.9304	0.02	.24920-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.11970-02
				200.9304	0.03	.44130-02	CLR TRIP/CORRECT/RESTART CLR	0.000	.17650-02
4	FUNCTION VALVES								
BLOCK PARTS		1.00	2	65.5200					
MODE:	MODE=LOW FO FLOW/LOW STM PRES		1	65.5200	0.30	.13440-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.13440-02
	MODE=LOW FO FLOW/FLAME OUT			65.5200	0.15	.64900-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.27810-02
	MODE=HI FO FLOW/SMOKE			65.5200	0.05	.23330-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.23330-03
	MODE=HI FO FLOW/MI STM PRES			65.5200	0.30	.13440-01	NO EFFECT	0.0	.0
	MODE=HI FO FLOW/EXCBV FO			65.5200	0.20	.02610-02	EXPLOSIVE CONDITION	0.500	.40300-02

BLOCK PARTS	D.C.	QTY	FUNCTION FAILURE PROB.	FAIL. MODE FREQ. RATE	FAIL. MODE FAIL. PROB.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK 4 FUNCTION RELAYS								
MODE1	1.00	2	0.0710	0.12	.75510-04	ALARM/ACTIVATE REMOTE MANUAL	0.100	.75510-05
MODE=LOW FLOW/LOW STM PRES		1	0.0710	0.16	.10090-03	RLR TRIP/CORRECT/RESTART RLR	0.400	.40360-04
MODE=LOW FLOW/FLAME OUT			0.0710	0.16	.11390-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.11390-04
MODE=HI FLOW/SHOCK			0.0710	0.09	.56000-02	NO EFFECT	0.0	.0
MODE=HI FLOW/SHOCK STM PRES			0.0710	0.03	.10570-04	EXPLOSIVE CONDITION	0.500	.72450-05
MODE=HI FLOW/EXCBV FLOW			0.0710	0.20	.12610-03	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.12610-04
MODE=LOSS OF CONTROL/COINR CNTL			0.0710	0.10	.03130-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
MODE=LOSS OF PURGE/LOW AIR			0.0710	0.04	.25380-04	ALARM/ACTIVATE REMOTE MANUAL	0.100	.25380-04
MODE=HI COMBUST AIR/SHOCK			0.0710	0.03	.19190-04	ALARM/ACTIVATE REMOTE MANUAL	0.100	.19190-05
MODE=HI COMBUST AIR/FLAME OUT			0.0710	0.03	.19190-04	MPC REDUCES RPM/CORRECT/RESUME	0.400	.76750-05
MODE=HI COMBUST AIR/LOW STEAM								
BLOCK 4 FUNCTION ACTUATORS								
MODE1	1.00	2	30.4000	0.20	.40000-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.40000-03
MODE=HI COMBUST AIR/SHOCK		1	30.4000	0.05	.12310-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12310-03
MODE=HI COMBUST AIR/FLAME OUT			30.4000	0.10	.34650-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.97600-03
MODE=HI COMBUST AIR/LOW STEAM			30.4000	0.15	.34650-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.34650-03
MODE=HI COMBUST AIR/SHOCK			30.4000	0.05	.12310-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12310-03
MODE=LOW COMBUST AIR/EXCBV FLOW			30.4000	0.05	.12310-02	EXPLOSIVE CONDITION	0.500	.61160-03
MODE=LOW COMBUST AIR/EXCBV FLOW			30.4000	0.10	.34650-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.97600-03
MODE=LOW COMBUST AIR/LOW STM			30.4000	0.15	.34650-02	RLR TRIP/CORRECT/RESTART RLR	0.400	.10460-02
MODE=LOW COMBUST AIR/RLR TRIP								
BLOCK 4 FUNCTION TRANSDUCERS								
MODE1	1.00	1	63.0001	0.10	.61490-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.61490-03
MODE=LOW FLOW/LOW STM PRES		1	63.0001	0.09	.40740-02	RLR TRIP/CORRECT/RESTART RLR	0.400	.16290-02
MODE=LOW FLOW/FLAME OUT			63.0001	0.09	.42090-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.42090-03
MODE=HI FLOW/SHOCK			63.0001	0.07	.31700-02	NO EFFECT	0.0	.0
MODE=HI FLOW/SHOCK STM PRES			63.0001	0.07	.31700-02	EXPLOSIVE CONDITION	0.500	.15850-02
MODE=HI FLOW/EXCBV FLOW			63.0001	0.11	.40610-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.40610-03
MODE=HI COMBUST AIR/SHOCK			63.0001	0.09	.36220-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.36220-03
MODE=HI COMBUST AIR/FLAME OUT			63.0001	0.09	.36220-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.10460-02
MODE=HI COMBUST AIR/LOW STEAM			63.0001	0.22	.90840-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.90840-03
MODE=LOW COMBUST AIR/SHOCK			63.0001	0.05	.24910-02	EXPLOSIVE CONDITION	0.500	.12400-02
MODE=LOW COMBUST AIR/EXCBV FLOW								
BLOCK 4 FUNCTION CONTROLLERS								
MODE1	1.00	2	0.9120	0.15	.10460-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.10460-03
MODE=HI COMBUST AIR/SHOCK		1	0.9120	0.17	.20060-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.20060-03
MODE=HI COMBUST AIR/FLAME OUT			0.9120	0.07	.30060-03	MPC REDUCES RPM/CORRECT/RESUME	0.400	.20060-03
MODE=HI COMBUST AIR/LOW STEAM			0.9120	0.11	.30060-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.30060-04
MODE=HI COMBUST AIR/SHOCK			0.9120	0.12	.61610-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.61610-04
MODE=LOW COMBUST AIR/SHOCK			0.9120	0.03	.20410-03	EXPLOSIVE CONDITION	0.500	.10200-03
MODE=LOW COMBUST AIR/EXCBV FLOW			0.9120	0.06	.91510-03	MPC REDUCES RPM/CORRECT/RESUME	0.400	.10610-03
MODE=LOW COMBUST AIR/LOW STM			0.9120	0.09	.62610-03	RLR TRIP/CORRECT/RESTART RLR	0.400	.25050-03
MODE=LOW COMBUST AIR/RLR TRIP								

		D.C.	QTY	FUNCTION FAIL MODE PRIO. FRAT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	5	FUNCTION ELECTRONIC/DRUM LVL CNTL	1.00	2	271.4355				
MODE1		MODE=HI DRUM LVL	1	271.4355	0.39	.7294D-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.7294D-02
		MODE=HI DRUM LVL/SPILL TO TURN	1	271.4355	0.04	.4484D-02	LOSS OF PROTECTIVE FEATURE	0.500	.4222D-02
		MODE=LOW DRUM LVL/BLN TRIP	1	271.4355	0.25	.4667D-01	BLN TRIP/CORRECT/RESTART BLN	0.800	.1867D-01
		MODE=LOW DRUM LVL/MI BTH TRIP	1	271.4355	0.12	.23A1D-01	EXPLOSIVE CONDITION	0.500	.1191D-01
		MODE=LOW DRUM LVL/MI BLN TRIP	1	271.4355	0.04	.4662D-02	EXPLOSIVE CONDITION	0.500	.4031D-02
		MODE=FALSE ALARM	1	271.4355	0.05	.4635D-02	FALSE ALARM	0.0	.0
		MODE=LOSS OF CONTROL/DRUM LVL	1	271.4355	0.14	.1984D-01	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.1984D-02
BLOCK PARTS	5	FUNCTION TRANSDUCERS	1.00	2	71.9600				
MODE1		MODE=HI DRUM LVL	1	71.9600	0.12	.5690D-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.5690D-03
		MODE=HI DRUM LVL/SPILL TO TURN	1	71.9600	0.01	.4640D-03	LOSS OF PROTECTIVE FEATURE	0.500	.3320D-03
		MODE=LOW DRUM LVL/BLN TRIP	1	71.9600	0.04	.1787D-02	BLN TRIP/CORRECT/RESTART BLN	0.400	.7146D-03
		MODE=LOW DRUM LVL/MI BTH TRIP	1	71.9600	0.02	.4682D-03	EXPLOSIVE CONDITION	0.500	.4341D-03
		MODE=LOW DRUM LVL/MI BLN TRIP	1	71.9600	0.01	.3665D-03	EXPLOSIVE CONDITION	0.500	.1535D-03
		MODE=LOSS OF CONTROL/DRUM LVL	1	71.9600	0.01	.4074D-01	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.4074D-02
BLOCK PARTS	6	FUNCTION ELECTRONIC/FM CNTL	1.00	1	42.7669				
MODE1		MODE=LOW FM PRESS/LOW DRUM	1	42.7669	0.51	.1540D-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.1540D-02
		MODE=LOSS OF REMOTE MANUAL	1	42.7669	0.01	.2429D-03	LOSS OF BACK-UP OR ALARM	0.200	.4050D-04
		MODE=HI FM PRESS/MI DRUM LVL	1	42.7669	0.10	.5691D-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.5691D-03
		MODE=HI FM PRESS/MI DRUM LVL	1	42.7669	0.10	.5691D-02	TURN TRIP--CORRECT/RESTART TUR	0.700	.3817D-02
		MODE=LOSS OF CONTROL/FM PMP	1	42.7669	0.12	.3607D-02	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.3607D-03
BLOCK PARTS	6	FUNCTION TRANSDUCERS	1.00	1	37.5400				
MODE1		MODE=LOW FM PRESS/LOW DRUM	1	37.5400	0.33	.4670D-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.4670D-03
		MODE=HI FM PRESS/MI DRUM LVL	1	37.5400	0.17	.4660D-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.4660D-03
		MODE=HI FM PRESS/MI DRUM LVL	1	37.5400	0.17	.4660D-02	TURN TRIP--CORRECT/RESTART TUR	0.700	.3177D-02
		MODE=LOSS OF CONTROL/FM PMP	1	37.5400	0.34	.4942D-02	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.4942D-03
BLOCK PARTS	7	FUNCTION ELECTRONIC/FM RECRC VLV CNTL	1.00	1	18.3752				
MODE1		MODE=FM RECRC VLV OPEN/LO DRUM	1	18.3752	0.15	.2020U-02	BLN TRIP/CORRECT/RESTART BLN	0.400	.4641D-03
		MODE=FM RECRC VLV CLS/PMP FAIL	1	18.3752	0.24	.2671D-02	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE=FALSE ALARM	1	18.3752	0.32	.4140D-02	FALSE ALARM	0.0	.0
		MODE=ALARM FAILS	1	18.3752	0.32	.4140D-02	LOSS OF BACK-UP OR ALARM	0.200	.4132D-03

BLOCK PARTS	Q.C.	QTY	FUNCTION FAILURE PROB. PART	FAIL. MODT. PROB. PART	FAIL. MODT. PROB. PART	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
7	FUNCTION VALVES							
MODE1	MODE1 RECRC VLV OPN/LO DRHM	1.00	1	32.7600				
MODE1	MODE1 RECRC VLV CLS/PHP FATH	1.00	1	32.7600	0.50	.11560-01	0.400	.46250-02
					0.50	.11560-01	0.0	.0
7	FUNCTION TRANSDUCERS							
MODE1	MODE1 RECRC VLV OPN/LO DRHM	1.00	1	29.3000				
MODE1	MODE1 RECRC VLV CLS/PHP FATH	1.00	1	29.3000	0.67	.13460-01	0.400	.55450-02
					0.33	.68210-02	0.0	.0
8	FUNCTION ELECTRONIC/SHTR STM TEMP ENTL							
MODE1	MODE1 LOW STM TEMP/NET STM TRM	1.00	2	132.0700				
	MODE1 STM TEMP/PUPTURE TIME		1	132.0700	0.36	.33470-01	0.500	.16730-01
	MODE1 LOSS OF REMOT MANUAL			132.0700	0.23	.81660-01	0.100	.21060-02
	MODE1 FALSE ALARM			132.0700	0.00	.93770-00	0.200	.10730-00
	MODE1 ALARM FAILS			132.0700	0.09	.83110-02	0.0	.0
	MODE1 LOSS OF CONTROL/STM PPR			132.0700	0.10	.13400-01	0.200	.27010-02
					0.10	.16200-01	0.100	.16200-02
8	FUNCTION VALVES							
MODE1	MODE1 LOW STM TEMP/NET STM TRM	1.00	2	65.5200				
			1	65.5200	1.00	.45450-01	0.500	.22730-01
8	FUNCTION TRANSDUCERS							
MODE1	MODE1 LOW STM TEMP/NET STM TRM	1.00	2	58.6000				
MODE1	MODE1 STM TEMP/PUPTURE TIME		1	58.6000	0.67	.27530-01	0.500	.13770-01
				58.6000	0.33	.13600-01	0.100	.13600-02
8	FUNCTION SENSORS							
MODE1	MODE1 LOW STM TEMP/NET STM TRM	1.00	2	17.7600				
	MODE1 STM TEMP/PUPTURE TIME		1	17.7600	0.25	.31690-02	0.500	.15740-02
	MODE1 LOSS OF CONTROL/STM PPR			17.7600	0.02	.77000-02	0.100	.77000-03
				17.7600	0.13	.16300-02	0.100	.16300-03

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		D.C.	QTY	FUNCTION FAILURE PNO.	FAIL. MODE FREQ. RATIO	FAIL. MODE FAIL. PNO.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	4	FUNCTION ELECTRONIC/STM DUMP CNTL	1.00	1	13.1357				
MODE:		MODE=STEAM DUMP FAILS	1	13.1357	0.57	.53020-02	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE=STM DUMP VLV PARTLY OPEN		13.1357	0.09	.00030-03	HPC REDUCES RPM/CORRECT/RESUME	0.400	.13030-03
		MODE=STM DUMP VLV TOTAL OPEN		13.1357	0.09	.00030-03	TURN TRIP--CORRECT/RESTART TUR	0.700	.59380-03
BLOCK PARTS	9	FUNCTION VALVES	1.00	1	30.0000				
MODE:		MODE=STEAM DUMP FAILS	1	30.0000	0.51	.12060-01	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE=STM DUMP VLV PARTLY OPEN		30.0000	0.25	.03000-02	HPC REDUCES RPM/CORRECT/RESUME	0.400	.25200-02
		MODE=STM DUMP VLV TOTAL OPEN		30.0000	0.25	.03000-02	TURN TRIP--CORRECT/RESTART TUR	0.700	.00100-02
BLOCK PARTS	9	FUNCTION TRANSDUCERS	1.00	2	2.0000				
MODE:		MODE=STEAM DUMP FAILS	1	2.0000	0.50	.70070-03	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE=STM DUMP VLV PARTLY OPEN		2.0000	0.25	.35490-03	HPC REDUCES RPM/CORRECT/RESUME	0.400	.14200-03
		MODE=STM DUMP VLV TOTAL OPEN		2.0000	0.25	.35490-03	TURN TRIP--CORRECT/RESTART TUR	0.700	.20450-03
BLOCK PARTS	10	FUNCTION ELECTRONIC/FND PD START/STOP CNTL	1.00	2	30.0076				
MODE:		MODE=STONY FPSTRT/HT FM PRES	1	30.0076	0.20	.56510-02	NO EFFECT	0.0	.0
		MODE=FM PMP FAIL DUE TO CNTL		30.0076	0.33	.71800-02	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE=FM PMP AUTO SM FAILURE		30.0076	0.01	.00750-02	LOSS OF BACK-UP OR ALARM	0.200	.17750-02
BLOCK PARTS	10	FUNCTION SWITCHES	1.00	2	00.6000				
MODE:		MODE=FM PMP FAIL DUE TO CNTL	1	00.6000	0.00	.13070-01	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE=FM PMP AUTO SM FAILURE		00.6000	0.00	.21000-01	LOSS OF BACK-UP OR ALARM	0.200	.02100-02
BLOCK PARTS	11	FUNCTION ELECTRONIC/DEAERATOR LVL CNTL	1.00	1	20.0772				
MODE:		MODE=MI DEAERATOR/LOW DRUM	1	20.0772	0.07	.70050-02	NO EFFECT	0.0	.0
		MODE=LOW DEAERATOR/LOW DRUM		20.0772	0.07	.69610-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.00010-03
		MODE=LOSS OF REMOTE MANUAL		20.0772	0.02	.23030-03	LOSS OF BACK-UP OR ALARM	0.200	.07050-00
		MODE=LOSS OF CONTROL/DEAERATOR		20.0772	0.04	.00020-03	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.00020-04

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		O.C.	QTY	FUNCTION FAILURE PROB. FMT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. PROB.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	11	FUNCTION VALVES							
			1.00	1	65.5200				
		MODEMHI DEAFRATOR/LOW DRUM	1	65.5200	0.75	.34290-01	NO EFFECT	0.0	.0
		MODELOW DEAFRATOR/LOW DRUM	1	65.5200	0.25	.11560-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.11560-02
BLOCK PARTS	11	FUNCTION TRANSDUCERS							
			1.00	1	19.1300				
		MODEMHI DEAFRATOR/LOW DRUM	1	19.1300	0.67	.90990-02	NO EFFECT	0.0	.0
		MODELOW DEAFRATOR/LOW DRUM	1	19.1300	0.33	.04320-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.04320-03
BLOCK PARTS	12	FUNCTION ELECTRONIC/FO HEADER TEMP							
			1.00	1	20.0022				
		MODEMLO FO TEMP/SMOKE	1	20.0022	0.53	.77530-02	BLR TRIP/CORRECT/RESTART BLR	0.400	.31010-02
		MODEMHI FO TEMP/POSRL FLASH	1	20.0022	0.38	.55430-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.55430-03
		MODEMLOSS OF REMOTE MANUAL	1	20.0022	0.05	.78250-03	LOSS OF BACK-UP OR ALARM	0.200	.15650-03
		MODEMLOSS OF CONTROL/FO TEMP	1	20.0022	0.04	.63490-03	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.63490-04
BLOCK PARTS	12	FUNCTION VALVES							
			1.00	1	36.0500				
		MODEMLO FO TEMP/SMOKE	1	36.0500	0.52	.13200-01	BLR TRIP/CORRECT/RESTART BLR	0.400	.52700-02
		MODEMHI FO TEMP/POSRL FLASH	1	36.0500	0.48	.12240-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12240-02
C-8 BLOCK PARTS	12	FUNCTION TRANSDUCERS							
			1.00	1	5.3756				
		MODEMLO FO TEMP/SMOKE	1	5.3756	0.37	.14140-02	BLR TRIP/CORRECT/RESTART BLR	0.400	.56750-03
		MODEMHI FO TEMP/POSRL FLASH	1	5.3756	0.41	.15750-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.15750-03
		MODEMLOSS OF CONTROL/FO TEMP	1	5.3756	0.21	.02020-03	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.02020-04
BLOCK PARTS	13	FUNCTION ELECTRONIC/FO RECRC CNT							
			1.00	1	13.0018				
		MODEMLO FO PRES/BLR TRIP	1	13.0018	0.23	.21030-02	BLR TRIP/CORRECT/RESTART BLR	0.400	.68100-03
		MODEMLO FO PRES/FLAME OUT	1	13.0018	0.15	.14020-02	BLR TRIP/CORRECT/RESTART BLR	0.400	.56090-03
		MODEMHI FO/MI 5TH PRESSURE	1	13.0018	0.62	.57070-02	NO ALARM--ONLY LIGHT/INDICATOR	0.500	.28500-02

		D.C.	QTY	FUNCTION FAILURE PROR.	FAIL. MODE FREQ. RATIO	FAIL. MODE FAIL. PROR.	SYSTEM EFFECT	MISSION LOSS PROR.	MISSION CRITICALITY [C]
BLOCK PARTS	13	FUNCTION VALVES							
MODE:		1.00	1	33.6600					
			1	33.6600	0.30	.70730-02	RLR TRIP/CORRECT/RESTART RLR	0.400	.20290-02
				33.6600	0.20	.47210-02	RLR TRIP/CORRECT/RESTART RLR	0.400	.18880-02
				33.6600	0.50	.12040-01	NO ALARM--ONLY LIGHT/INDICATOR	0.500	.59980-02
BLOCK PARTS	13	FUNCTION TRANSDUCERS							
MODE:		1.00	1	0.5000					
			1	0.5000	1.00	.35490-03	NO ALARM--ONLY LIGHT/INDICATOR	0.500	.17750-03
BLOCK PARTS	14	FUNCTION ELECTRONIC/LO PUMP CNTLS							
MODE:		1.00	2	10.3156					
			1	10.3156	0.21	.21220-02	AUTO BACK-UP TAKES OVER	0.0	.0
				10.3156	0.79	.80080-02	LOSS OF BACK-UP OR ALARM	0.200	.16420-02
BLOCK PARTS	14	FUNCTION SWITCHES							
MODE:		1.00	2	40.2600					
			1	40.2600	0.07	.20560-02	AUTO BACK-UP TAKES OVER	0.0	.0
				40.2600	0.93	.26180-01	LOSS OF BACK-UP OR ALARM	0.200	.52360-02
BLOCK PARTS	14	FUNCTION RELAYS							
MODE:		1.00	2	1.0600					
			1	1.0600	1.00	.75230-03	LOSS OF BACK-UP OR ALARM	0.200	.15450-03
BLOCK PARTS	15	FUNCTION ELECTRONIC/ITC							
MODE:		1.00	1	130.5641					
			1	130.5641	0.20	.26690-01	FALSE TURB TRIP/CORRECT/RESTART	0.700	.10480-01
				130.5641	0.10	.90570-02	ERRATIC RPMs/USE HANDPUMP	0.600	.56740-02
				130.5641	0.01	.77540-03	ERRATIC DIR CONTROL/USE HOPMP	0.600	.48520-03
				130.5641	0.05	.44500-02	ERRATIC DIR CONTROL/USE HOPMP	0.600	.26760-02
				130.5641	0.04	.41610-02	NO ALARM--ONLY LIGHT/INDICATOR	0.500	.20000-02
				130.5641	0.37	.71490-02	LOSS OF PROTECTIVE FEATURE	0.500	.35750-02
				130.5641	0.19	.17670-01	LOSS OF TRIP	0.500	.89370-02
				130.5641	0.03	.32910-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
				130.5641	0.06	.58410-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
				130.5641	0.17	.10540-01	LOSS OF PROTECTIVE FEATURE	0.500	.02690-02

		P.P.	QTY	FUNCTION FAILURE FROM FMT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)	
BLOCK PARTS	15	FUNCTION SWITCHES	1.00	1	123.5000	0.03	.24500-02	LOSS OF BACK-UP OR ALARM	0.200	.49000-03
MODE:		MODE=LOSS OF TURNING GEAR	1	123.5000	0.03	.53610-01	LOSS OF TRIP	0.500	.26010-01	
		MODE=LOSS OF TURN TRIP	1	123.5000	0.26	.22010-01	ERRATIC RPMs/USE HANDPUMP	0.600	.13690-01	
		MODE=LOSS OF CONTROL/HYDR FAIL	1	123.5000	0.08	.70020-02	LOSS OF BACK-UP OR ALARM	0.200	.16160-02	
		MODE=LOSS OF HANDPUMP	1	123.5000						
BLOCK PARTS	15	FUNCTION VALVES	1.00	1	120.2000	0.12	.11230-01	FALSE TURN TRIP/CORRECT/RESTART	0.700	.70500-02
MODE:		MODE=FALSE TURNING TRIP	1	120.2000	0.15	.13500-01	NOT APPLICABLE TO THIS PHASE	0.0	.0	
		MODE=FAST GUARD VLV FAIL CLOSED	1	120.2000	0.25	.22050-01	NOT APPLICABLE TO THIS PHASE	0.0	.0	
		MODE=DRAIN VLV FAIL CLOSED	1	120.2000	0.41	.36550-01	ERRATIC RPMs/USE HANDPUMP	0.600	.21630-01	
		MODE=LOSS OF CONTROL/HYDR FAIL	1	120.2000	0.06	.56240-02	LOSS OF BACK-UP OR ALARM	0.200	.11260-02	
		MODE=LOSS OF HANDPUMP	1	120.2000						
BLOCK PARTS	15	FUNCTION RELAYS	1.00	1	25.2500	0.10	.17910-02	FALSE TURN TRIP/CORRECT/RESTART	0.700	.12500-02
MODE:		MODE=FALSE TURNING TRIP	1	25.2500	0.02	.83620-01	ERRATIC DIR CONTROL/USE HANDPUMP	0.600	.25010-03	
		MODE=LOSS OF CRASH BACK	1	25.2500	0.02	.43620-03	NOT APPLICABLE TO THIS PHASE	0.0	.0	
		MODE=LOSS OF TURB/ARM RPM +5	1	25.2500	0.01	.21510-03	LOSS OF BACK-UP OR ALARM	0.200	.43020-00	
		MODE=LOSS OF TURNING GEAR	1	25.2500	0.06	.14050-01	LOSS OF TRIP	0.500	.70730-02	
		MODE=LOSS OF TURN TRIP	1	25.2500						
BLOCK PARTS	15	FUNCTION ACTUATORS	1.00	1	2.3000	1.00	.10600-02	ERRATIC RPMs/USE HANDPUMP	0.600	.99000-03
MODE:		MODE=LOSS OF CONTROL/HYDR FAIL	1	2.3000						
BLOCK PARTS	15	FUNCTION TRANSFORMERS	1.00	1	20.7000	1.00	.10500-01	ERRATIC RPMs/USE HANDPUMP	0.600	.07500-02
MODE:		MODE=LOSS OF CNTRL/HYDR FAIL	1	20.7000						
BLOCK PARTS	15	FUNCTION SENSORS	1.00	1	763.2000	0.13	.03600-01	FALSE TURN TRIP/CORRECT/RESTART	0.700	.10550-01
MODE:		MODE=FALSE TURNING TRIP	1	763.2000	0.22	.30020-01	ERRATIC RPMs/USE HANDPUMP	0.600	.23950-01	
		MODE=ARM/AST VLV SETTING FAIL	1	763.2000	0.22	.30020-01	ERRATIC DIR CONTROL/USE HANDPUMP	0.600	.23950-01	
		MODE=ARM/AST VLV OPENING	1	763.2000	0.22	.30020-01	NO ALARM--ONLY LIGHT/INDICATOR	0.500	.19000-01	
		MODE=LOSS OF RATE CHANGE	1	763.2000	0.22	.30020-01	NOT APPLICABLE TO THIS PHASE	0.0	.0	
		MODE=LOSS OF TURB/ARM RPM +5	1	763.2000						
BLOCK PARTS	15	FUNCTION SOLENOIDS	1.00	1	25.3700	0.53	.00300-02	FALSE TURN TRIP/CORRECT/RESTART	0.700	.00010-02
MODE:		MODE=FALSE TURNING TRIP	1	25.3700	0.07	.05020-02	ERRATIC RPMs/USE HANDPUMP	0.600	.51010-02	
		MODE=LOSS OF CONTROL/HYDR FAIL	1	25.3700						
BLOCK PARTS	15	FUNCTION PUMPS	1.00	1	157.0000	1.00	.10600	ERRATIC RPMs/USE HANDPUMP	0.600	.03000-01
MODE:		MODE=LOSS OF CONTROL/HYDR FAIL	1	157.0000						

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS BURNER MANAGEMENT/MASTER

SFE	SYSTEM EFFECT	MFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF BURNER MAN FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION BURNER MAN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
4	NLR TRIP/CORRECT/RESTART NLP	5	.1759E-01	19.5736	1.8345	0.4000	.1887E-01	50.7692	2.4266
16	LOSS OF TRIP	7	.3647E-01	10.9987	1.4097	0.5000	.1795E-01	48.3134	2.4000
3	ALARM/ACTIVATE REMOTE MANUAL	1	.1766E-02	4.7263	0.0481	0.1000	.1765E-03	0.4750	0.0264
8	MPC REDUCES RPM/CORRECT/RESUME	5	.1924E-03	0.1614	0.0151	0.4000	.1568E-03	0.0224	0.0235
1	NOT APPLICABLE TO THIS PHASE	1	.1549	64.5304	0.0460	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS BURNER MODULE

SFE	SYSTEM EFFECT	MFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF BURNER MOD FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION BURNER MOD CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
16	LOSS OF TRIP	7	.4491E-01	12.3121	2.5060	0.5000	.3184E-01	57.2511	4.7441
4	NLR TRIP/CORRECT/RESTART NLP	5	.3914E-01	7.4123	1.5007	0.4000	.1552E-01	25.4910	2.3202
3	ALARM/ACTIVATE REMOTE MANUAL	1	.1380	20.1298	5.3103	0.1000	.1355E-01	22.2579	2.0294
2	NO EFFECT	2	.1529E-01	0.6766	1.3505	0.0	.0	0.0	0.0
1	NOT APPLICABLE TO THIS PHASE	1	.2507	47.4712	0.4621	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMBUST ENTL/NLR AND LCC

SFE	SYSTEM EFFECT	MFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF COMBUST EN FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMBUST EN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
8	MPC REDUCES RPM/CORRECT/RESUME	5	.4075E-01	41.8316	1.5707	0.4000	.1612E-01	57.0734	2.4146
6	EXPLOSIVE CONDITION	7	.1938E-01	19.8747	0.7476	0.5000	.0637E-02	34.1182	1.4434
13	LOSS OF BACK-UP OR ALARM	14	.0368E-02	0.5462	0.3224	0.2000	.1866E-02	5.8972	0.2495
18	FALSE TRIP/THW/CORRECT/RESTART	10	.1175E-02	1.2067	0.0453	0.7000	.8223E-03	2.4112	0.1232
5	AUTO BACK-UP TAKES OVER	2	.1938E-01	19.8747	0.7476	0.0	.0	0.0	0.0
18	FALSE ALARM	7	.0368E-02	0.5462	0.3224	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMBUSTION CONTROL

SFF	SYSTEM EFFECT	MFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF COMBUSTION FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMBUSTION CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
3	ALARM/ACTIVATE REMOTE MANUAL	3	.158E	50.8445	5.4657	0.1000	.1530E-01	32.1343	2.3030
6	EXPLOSIVE CONDITION	7	.3064E-01	11.6677	1.1829	0.5000	.1530E-01	31.9633	2.2912
4	RLN INIP/CORRECT/RESTART RLN	5	.2554E-01	9.7293	0.7044	0.0000	.1423E-01	21.3336	1.5203
4	MPC REDUCES RPM/CORRECT/RESUME	4	.1362E-01	5.1775	0.5249	0.0000	.5440E-02	11.3670	0.8108
12	AUTO CONTROL OUTPUT IS ERRATIC	4	.1339E-01	5.0924	0.5163	0.1000	.1331E-02	2.7806	0.1993
13	LOSS OF BACK-UP OR ALARM	14	.0007E-03	0.3707	0.0105	0.2000	.1906E-03	0.4172	0.0299
1	NOT APPLICABLE TO THIS PHASE	1	.0310E-04	0.0200	0.0024	0.0	.0	0.0	0.0
5	AUTO BACK-UP TAKES OVER	2	.1101E-02	0.4300	0.0444	0.0	.0	0.0	0.0
2	NO EFFECT	2	.2275E-01	0.4500	0.0770	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS FEEDWATER CONTROL

SFF	SYSTEM EFFECT	MFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF FEEDWATER FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION FEEDWATER CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
7	TURB TRIP--CORRECT/RESTART TURB	10	.0970E-02	17.0923	0.3005	0.7000	.6764E-02	59.6759	1.0432
3	ALARM/ACTIVATE REMOTE MANUAL	3	.3021E-01	59.7911	1.3185	0.1000	.3002E-02	29.1547	0.5096
12	AUTO CONTROL OUTPUT IS ERRATIC	3	.1260E-01	27.0906	0.4855	0.1000	.1233E-02	10.7532	0.1880
13	LOSS OF BACK-UP OR ALARM	14	.2429E-03	0.4260	0.0994	0.2000	.0450E-04	0.4163	0.0073

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS DRUM LEVEL CONTROL

SFF	SYSTEM EFFECT	MFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF DRUM LEVEL FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION DRUM LEVEL CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
4	MPC TRIP/CORRECT/RESTART MLC	4	.0454E-01	20.3365	1.9113	0.4000	.1930E-01	35.0959	2.0034
6	EXPLOSIVE CONDITION	7	.1317E-01	13.6034	1.2785	0.5000	.1043E-01	30.2490	2.0004
3	ALARM/ACTIVATE REMOTE MANUAL	3	.0101E-01	13.0744	1.1460	0.1000	.7007E-02	14.5121	1.1004
12	AUTO CONTROL OUTPUT IS ERRATIC	3	.0103E-01	25.2764	2.3757	0.1000	.0057E-02	11.1560	0.9074
10	LOSS OF PROTECTIVE FEATURE	7	.0104E-02	3.7504	0.1525	0.5000	.0554E-02	0.3066	0.0021
14	FALSE ALARM	2	.0672E-02	3.5570	0.1343	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS FM RECIRC VALVE CONTROL

SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF FM RECIRC V FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION FM RECIRC V CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	4 H/L TRIP/CORRECT/RESTART R/L	9	.2761E-01	48.3876	1.0643	0.4000	.1098E-01	92.9453	1.0644
	13 LOSS OF BACK-UP OR ALARM	14	.4175E-02	7.3103	0.1649	0.2000	.8332E-03	7.8547	0.1240
	5 AUTO BACK-UP TAKES OVER	2	.2115E-01	37.2310	0.8152	0.0	.0	0.0	0.0
	14 FALSE ALARM	2	.4175E-02	7.3103	0.1649	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS SMTR STM TEMP CNTRL

SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF SMTR STM T FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION SMTR STM T CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	11 NO ALARM--ONLY LIGHT/INDICATOR	7	.1116	57.3940	4.3030	0.5000	.5440E-01	44.2235	4.2046
	3 ALARM/ACTIVATE REMOTE MANUAL	1	.0279E-01	22.0015	1.0096	0.1000	.4245E-02	4.4706	0.0350
	13 LOSS OF BACK-UP OR ALARM	14	.1369E-01	7.0385	0.5277	0.2000	.2720E-02	4.2702	0.4674
	12 AUTO CONTROL OUTPUT IS ERRATIC	3	.1805E-01	9.2796	0.6950	0.1000	.1701E-02	2.8107	0.2683
	14 FALSE ALARM	2	.4344E-02	4.2966	0.3217	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS STEAM DUMP CONTROL

SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF STEAM DUMP FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION STEAM DUMP CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	7 TURB TRIP--CORRECT/RESTART TURB	10	.7524E-02	22.1153	0.2900	0.7000	.5253E-02	67.6363	0.7460
	4 MPC REDUCES RPM/CORRECT/RESUME	4	.7524E-02	22.1153	0.2900	0.4000	.3061E-02	36.3636	0.4446
	5 AUTO BACK-UP TAKES OVER	2	.1497E-01	55.7494	0.7314	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS FWD FP START/STOP CNTRL MODULE

SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF FWD FP STA FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION FWD FP STA CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	13 LOSS OF BACK-UP OR ALARM	14	.3022E-01	52.9526	1.1649	0.2000	.5991E-02	100.0000	0.4974
	2 NO EFFECT	2	.5467E-02	9.9208	0.2184	0.0	.0	0.0	0.0
	5 AUTO BACK-UP TAKES OVER	2	.2116E-01	37.1175	0.8165	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS DEAERATOR LEVEL CONTROL									
SFF	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF DEAERATOR FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION DEAERATOR CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	3 ALARM/ACTIVATE REMOTE MANUAL	3	.2306E-01	30.7438	0.0000	0.1000	.2295E-02	95.3606	0.3438
	12 AUTO CONTROL OUTPUT IS ERRATIC	3	.4900E-03	0.0500	0.0247	0.1000	.6002E-04	2.6597	0.0096
	13 LOSS OF BACK-UP OR ALARM	10	.2503E-03	0.3178	0.0092	0.2000	.0765E-04	1.0797	0.0071
	2 NO EFFECT	7	.5106E-01	60.0000	1.9642	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS FUEL OIL HEADER TEMP									
SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF FUEL OIL N FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION FUEL OIL N CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	4 HLR TRIP/CORRECT/RESTART HLR	5	.2249E-01	50.0070	0.0000	0.4000	.0007E-02	70.0000	1.3402
	3 ALARM/ACTIVATE REMOTE MANUAL	3	.1900E-01	0.0550	0.7500	0.1000	.1730E-02	17.3333	0.2901
	13 LOSS OF BACK-UP OR ALARM	10	.7020E-03	1.7717	0.0302	0.2000	.1565E-03	1.3001	0.0230
	12 AUTO CONTROL OUTPUT IS ERRATIC	3	.1050E-02	3.2001	0.0501	0.1000	.1055E-03	1.3009	0.0210

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SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS FO REC'D CONTROL									
SFF	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF FO REC'D C FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION FO REC'D C CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	11 NO ALARM--ONLY LIGHT/INDICATOR	7	.1019E-01	51.1952	0.0005	0.5000	.0020E-02	50.0005	1.3525
	4 HLR TRIP/CORRECT/RESTART HLR	5	.1534E-01	0.0000	0.5012	0.0000	.0110E-02	00.5055	0.0166

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS LG PUMP CONTROLS									
SFF	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF LG PUMP CO FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION LG PUMP CO CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	13 LOSS OF BACK-UP OR ALARM	10	.3532E-01	0.0120	1.3010	0.2000	.0000E-02	100.0000	1.0007
	5 AUTO BACK-UP TAKES OVER	7	.0102E-02	10.5000	0.1012	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS ETC

NFE	SYSTEM EFFECT	NFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF ETC FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MIRRORED LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION ETC CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
14	EQUATIC PPN/USE HANDLING	12	.2475	19.4752	0.5001	0.6000	.1837	07.5562	21.5245
15	FALSE TMR TAP/CORRECT/RESTART	10	.7353E-01	11.7276	2.8343	0.7000	.5094E-01	10.8592	7.6386
16	LOSS OF TRIP	7	.4420E-01	14.8670	3.3997	0.5000	.0322E-01	10.3923	8.4733
19	EQUATIC DIN CONTINU/USE HOP-?	13	.8440E-03	7.4814	1.7887	0.6000	.2735E-01	4.0500	4.0941
11	NO ALARM--ONLY LIGHT/INDICATOR	7	.9491E-01	7.1629	1.7318	0.5000	.2204E-01	7.2943	5.3614
20	LOSS OF PROTECTIVE FEATURE	7	.2385E-01	3.0844	0.9194	0.5000	.1190E-01	3.9199	1.7742
13	LOSS OF BACK-UP OR ALARM	14	.1542E-01	2.4681	0.5064	0.2000	.1071E-01	1.0180	0.4609
1	NOT APPLICABLE TO THIS PHASE	1	.0710E-01	13.9815	1.3597	0.0	.0	0.0	0.0

MISSION EFFECT	GROUPS SYSTEM CRITICALITY PROBABILITY	PCT CONT. TO SYSTEM CRITICALITY	MISSION CRITICALITY	PCT CONT. TO MISSION CRITICALITY
=====				
10 TEMPORARY D/W	.9220E-01	3.558	.639E-01	9.588
-----GROUP-----				
1 COMMIST ENTL/CLR DND LCC	.1175E-02	1.275	0.0008	1.285
-----GROUP-----				
6 FEEDWATER CONTROL	.9074E-02	10.017	0.0070	10.885
-----GROUP-----				
9 STEAM DUMP CONTROL	.7520E-02	0.160	0.0053	0.210
-----GROUP-----				
15 TIC	.7353E-01	79.740	0.0509	79.620
=====				
13 TEMP LOSS DIRECTIONAL CONTROL	.0640E-01	1.769	.2735E-01	0.096
-----GROUP-----				
15 TIC	.4640E-01	100.000	0.0273	100.000

MISSION EFFECT	GROUPS SYSTEM CRITICALITY PROBABILITY	PCT CONT. TO SYSTEM CRITICALITY	MISSION CRITICALITY	PCT CONT. TO MISSION CRITICALITY
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WMFF222

5 TEMPORARY REDUCED RPMs	.2896	11.164	.1147	17.187
GROUP				
1 BURNER MANAGEMENT/MASTER	.4708E-01	14.740	0.0190	16.502
GROUP				
2 BURNER MODULE	.3914E-01	13.514	0.0155	13.523
GROUP				
3 COMBUST CMTL/HLR DMD LGC	.4075E-01	14.069	0.0161	14.050
GROUP				
4 COMBUSTION CONTROL	.3921E-01	13.537	0.0156	13.630
GROUP				
5 OILM LEVEL CONTROL	.4950E-01	17.120	0.0194	16.893
GROUP				
7 FM RECPC VALVE CONTROL	.2761E-01	9.534	0.0110	9.567
GROUP				
9 STEAM DUMP CONTROL	.7524E-02	2.500	0.0030	2.616
GROUP				
12 FUEL OIL HEADER TEMP	.2249E-01	7.765	0.0009	7.798
GROUP				
13 FM RECNC CONTROL	.1534E-01	5.246	0.0041	5.333

WMFF222

12 TEMPORARY LOSS OF RPM CONTROL	.2875	9.530	.1437	21.524
GROUP				
15 TTC	.2875	100.000	0.1437	100.000

WMFF222

14 BACK-UP FAILURE	.1049	4.219	.2173E-01	3.254
GROUP				
3 COMBUST CMTL/HLR DMD LGC	.4364E-02	7.681	0.0017	7.667
GROUP				
4 COMBUSTION CONTROL	.9987E-03	0.912	0.0002	0.910
GROUP				
6 FEEDWATER CONTROL	.2929E-03	0.222	0.0000	0.224
GROUP				
7 FM RECNC VALVE CONTROL	.4173E-02	3.014	0.0004	3.035
GROUP				
8 SHTR STM TEMP CMTL	.1364E-01	12.504	0.0027	12.510
GROUP				
10 FWD FM START/STOP CMTL MODULE	.3072E-01	27.649	0.0040	27.575
GROUP				
11 DEAERATION LEVEL CONTROL	.2343E-03	0.214	0.0000	0.214
GROUP				
12 FUEL OIL HEADER TEMP	.7828E-03	0.715	0.0002	0.720
GROUP				
14 LH PUMP CONTROLS	.3537E-01	32.264	0.0070	32.163
GROUP				
15 TTC	.1542E-01	14.042	0.0031	14.150

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MISSION EFFECT	GROUPS SYSTEM CRITICALITY PROBABILITY	PCT CONT. TO SYSTEM CRITICALITY	MISSION CRITICALITY	PCT CONT. TO MISSION CRITICALITY
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CONFERENCE

3 SMALL PERFORMANCE DEGRADATION	.0034	23,249	.5951E-01	8,914
-----GROUP -----				
1 RUMMER MANAGEMENT/MASTER	.1740E-02	8,293	0.0002	0,297
-----GROUP -----				
2 RUMMER MODULE	.1380	22,866	0.0155	28,767
-----GROUP -----				
4 COMBUSTION CONTROL	.1002	27,869	0.0167	28,481
-----GROUP -----				
5 OIL LEVEL CONTROL	.1432	23,740	0.0139	23,422
-----GROUP -----				
6 FRESHWATER CONTROL	.0680E-01	7,756	0.0047	7,826
-----GROUP -----				
8 SHIP AIR TEMP CNTL	.0004E-01	10,000	0.0000	10,143
-----GROUP -----				
11 DEAGNATION LEVEL CONTROL	.2770E-01	3,927	0.0024	3,965
-----GROUP -----				
12 FUEL OIL HEADER TEMP	.2091E-01	3,466	0.0021	3,499

CONFERENCE

7 POSSIBLE BLK/TURN DAMAGE	.4906	18,525	.2346	35,440
-----GROUP -----				
1 RUMMER MANAGEMENT/MASTER	.3607E-01	7,568	0.0179	7,587
-----GROUP -----				
2 RUMMER MODULE	.0501E-01	13,527	0.0310	13,443
-----GROUP -----				
3 COMBUST CNTL/MLR DND LDC	.1930E-01	8,032	0.0096	4,073
-----GROUP -----				
4 COMBUSTION CONTROL	.3009E-01	4,305	0.0153	6,465
-----GROUP -----				
5 OIL LEVEL CONTROL	.4231E-01	8,604	0.0210	8,467
-----GROUP -----				
8 SHIP AIR TEMP CNTL	.1116	23,228	0.0500	23,162
-----GROUP -----				
13 FRESHWATER CONTROL	.1815E-01	3,776	0.0090	3,816
-----GROUP -----				
15 ETC	.1570	32,059	0.0771	32,507

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		U.C.	QTY	FUNCTION FAILURE REASON FOOT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PRGN.	MISSION CRITICALITY (C)
BLOCK PARTS	1	FUNCTION ELECTRONIC/IMP NOT TEST	1.00	2	130.1402				
MODE:		MODE=LOSS OF PURGE	1	130.1402	0.00	.0791n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=INADVERTENT PURGE		130.1402	0.01	.0445n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LIGHT-OFF LOGIC FAILURE		130.1402	0.21	.2202n-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF TRIP		130.1402	0.07	.7134n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=INADVERTENT PURGE		130.1402	0.01	.7884n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS/INADEQUATE REPC		130.1402	0.06	.5669n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FALSE TRIP		130.1402	0.11	.1102n-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FOV CLOSURE OR CANT OPEN		130.1402	0.12	.1209n-01	BLN TRIP/CORRECT/RESTART BLN	0.000	.0037n-02
		MODE=FOV CLOSURE OR CANT OPEN		130.1402	0.12	.1209n-01	BLN TRIP/CORRECT/RESTART BLN	0.000	.0037n-02
		MODE=FOV OPEN OR CANT CLOSE		130.1402	0.02	.1466n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FOV OPEN OR CANT CLOSE		130.1402	0.02	.1466n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FOV OPEN OR CANT CLOSE		130.1402	0.02	.1466n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF BRILEW TRIP		130.1402	0.02	.2352n-02	LOSS OF TRIP	0.500	.1174n-02
		MODE=LOSS OF PURGE TRIP		130.1402	0.04	.3414n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=PURGE INITIATED/IMP INHIBIT		130.1402	0.00	.3943n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=AIN FLOW TO PURGE LEVEL		130.1402	0.01	.1275n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=AIN FLOW TO PURGE LEVEL		130.1402	0.01	.1373n-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.1373n-03
		MODE=FOV FLD LTRFF LVL/NO FLAME		130.1402	0.00	.3924n-03	MPC REDUCES RPM/CORRECT/RESUME	0.000	.1569n-03
		MODE=FOV FLD LTRFF LVL/NO FLAME		130.1402	0.00	.3924n-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.1569n-04
		MODE=FOV REPC WITH FOTV CLOSED		130.1402	0.02	.1900n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FOV REPC INHIBIT SUPPRESSED		130.1402	0.06	.1902n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	1	FUNCTION SWITCHES	1.00	2	70.9200				
MODE:		MODE=LOSS OF PURGE	1	70.9200	0.11	.9273n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF TRIP		70.9200	0.09	.4622n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS/INADEQUATE REPC		70.9200	0.13	.4622n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF BRILEW TRIP		70.9200	0.47	.3322n-01	LOSS OF TRIP	0.500	.1661n-01
BLOCK PARTS	1	FUNCTION RELAYS	1.00	2	2.3000				
MODE:		MODE=LOSS OF PURGE	1	2.3000	0.00	.1636n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FALSE TRIP		2.3000	0.01	.1400n-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=LOSS OF BRILEW TRIP		2.3000	0.20	.3254n-03	LOSS OF TRIP	0.500	.1628n-03
		MODE=FOV REPC WITH FOTV CLOSED		2.3000	0.79	.1290n-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	1	FUNCTION VALVES	1.00	2	131.0000				
MODE:		MODE=LOSS/INADEQUATE PURGE	1	131.0000	0.50	.0565n-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=FOV CLOSURE OR CANT OPEN		131.0000	0.25	.2209n-01	BLN TRIP/CORRECT/RESTART BLN	0.000	.0196n-02
		MODE=FOV OPEN OR CANT CLOSE		131.0000	0.25	.2209n-01	NOT APPLICABLE TO THIS PHASE	0.0	.0

		D.C.	QTY	FUNCTION FAILURE PROB. FMT	FAIL. MODE FREQ. RATE	FAIL. MODE FAIL. PROB.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	2	FUNCTION ELECTRONIC/AMP MODULE	1.00	4	270.6858				
MODEM		MODEMNR LTOFF LOGIC FAILS	1	270.6858	0.02	.00020-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMIGNITION FAILURE	1	270.6858	0.06	.00090-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMFALSE TRIP	1	270.6858	0.07	.02700-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMLOSS OF TRIP	1	270.6858	0.02	.00300-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMFLAME INDICATION PROBLEM	1	270.6858	0.01	.05300-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEM20 SEC TIMER/TIMES LONG	1	270.6858	0.00	.00010-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR VLV 5 SEC SHUTN FAIL	1	270.6858	0.00	.00000-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR VLV 20 SEC SHUTN FAIL	1	270.6858	0.05	.07500-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR CLOSURE OR CANT OPEN	1	270.6858	0.01	.01200-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.76900-01
		MODEMIGNITION NOT WITHDRAWN	1	270.6858	0.05	.00020-02	NO EFFECT	0.0	.0
		MODEMNR OPENS OR CANT CLOSE	1	270.6858	0.01	.00200-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR VLV CLOSURE/CANT OPEN	1	270.6858	0.01	.00200-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.19200-01
		MODEMIGNITION EXTENDED	1	270.6858	0.01	.00200-02	NO EFFECT	0.0	.0
		MODEMIGNITION CANT BE EXTENDED	1	270.6858	0.01	.00200-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMFALSE NUMBER TRIP	1	270.6858	0.20	.07500-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.37500-02
		MODEMNR VLV OPENS/CANT CLOSE	1	270.6858	0.01	.00200-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR FAILS TO TRIP/AMP CLR	1	270.6858	0.02	.00550-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.13010-02
		MODEMNR FAILS TO TRIP/AMP FLAME	1	270.6858	0.27	.11100-01	LOSS OF TRIP	0.500	.25500-01
		MODEMNR FAILS TO TRIP/AMP CLR	1	270.6858	0.02	.02020-02	LOSS OF TRIP	0.500	.16310-02
BLOCK PARTS	2	FUNCTION SWITCHES	1.00	4	18A.6026				
MODEM		MODEMIGNITION FAILURE	1	18A.6026	0.10	.00510-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMLOSS OF TRIP	1	18A.6026	0.20	.00120-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR VLV 20 SEC SHUTN FAIL	1	18A.6026	0.07	.00330-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMNR VLV CLOSURE/CANT OPEN	1	18A.6026	0.75	.02070-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.32070-02
		MODEMFALSE NMR TRIP	1	18A.6026	0.10	.00510-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.00510-02
		MODEMNR FAILS TO TRIP/AMP CLOSE	1	18A.6026	0.07	.00330-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.16730-02
		MODEMNR FAILS TO TRIP/AMP CLR	1	18A.6026	0.07	.00330-02	LOSS OF TRIP	0.500	.00170-02
BLOCK PARTS	2	FUNCTION VALVES	1.00	4	131.0000				
MODEM		MODEMNR VLV CLOSURE/CANT OPEN	1	131.0000	0.50	.05050-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.05050-02
		MODEMNR VLV OPENS/CANT CLOSE	1	131.0000	0.50	.05050-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION RELAYS	1.00	4	17.2000				
MODEM		MODEMNR LTOFF LOGIC FAILS	1	17.2000	0.33	.00000-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMIGNITION FAILURE	1	17.2000	0.12	.00000-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMLOSS OF TRIP	1	17.2000	0.21	.00700-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMIGNITION CANT BE EXTENDED	1	17.2000	0.33	.00000-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION TRANSFORMERS	1.00	4	0.1600				
MODEM		MODEMIGNITION FAILURE	1	0.1600	1.00	.01300-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION ACTUATORS	1.00	4	137.0200				
MODEM		MODEMNR CLOSURE OR CANT OPEN	1	137.0200	0.25	.00100-01	CLR TRIP/CORRECT/RESTART CLR	0.400	.00100-02
		MODEMNR OPENS OR CANT CLOSE	1	137.0200	0.25	.00100-01	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODEMIGNITION EXTENDED	1	137.0200	0.25	.00100-01	NO EFFECT	0.0	.0
		MODEMIGNITION CANT BE EXTENDED	1	137.0200	0.25	.00100-01	NOT APPLICABLE TO THIS PHASE	0.0	.0

		D.C.	QTY	FUNCTION F2101 FLWR FMT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROP.	MISSION CRITICALITY (C)
BLACK PARTS	5	FUNCTION ELECTRONIC/COMBUST CNTRL CLR DND LB	1.00	1	65.6730				
MIMEI		MUDELOW STM PRES	1	65.6730	0.32	.14540-01	MPC REDUCES RPM/CORRECT/RESUME	0.400	.45140-02
		MUDEHMI STM PRES/STM DIMP ACT	1	65.6730	0.14	.03000-02	AUTO BACK-UP TAKES OVER	0.0	.0
		MUDEHMI STM PRES/SHUTTIME TIME	1	65.6730	0.14	.03000-02	EXPLOSIVE CONDITION	0.500	.31550-02
		MUDE=FALSE ALARM	1	65.6730	0.19	.03290-02	FALSE ALARM	0.0	.0
		MUDE=ALARM FAILR	1	65.6730	0.19	.03290-02	LOSS OF BACK-UP OR ALARM	0.200	.10600-02
		MUDE=FALSE TURBINE TRIP	1	65.6730	0.03	.11750-02	FALSE TURN TRIP/CORRECT/RESTART	0.700	.02230-03
BLACK PARTS	5	FUNCTION TRANSPIERS	1.00	1	75.5200				
MIMEI		MUDELOW STM PRES	1	75.5200	0.50	.25700-01	MPC REDUCES RPM/CORRECT/RESUME	0.400	.10700-01
		MUDEHMI STM PRES/STM DIMP ACT	1	75.5200	0.25	.12970-01	AUTO BACK-UP TAKES OVER	0.0	.0
		MUDEHMI STM PRES/SHUTTIME TIME	1	75.5200	0.25	.12970-01	EXPLOSIVE CONDITION	0.500	.04030-02
BLACK PARTS	5	FUNCTION ELECTRONIC/COMBUST CNTRL	1.00	2	200.9304				
MIMEI		MUDELOW FO FLOW/LOW STM PRES	1	200.9304	0.04	.05230-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.05230-03
		MUDELOW FO FLOW/FLAME OUT	1	200.9304	0.04	.06000-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.22740-02
		MUDEHMI FO FLOW/SHOVE	1	200.9304	0.04	.10700-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.10700-02
		MUDEHMI FO FLOW/HI STM PRES	1	200.9304	0.04	.05400-02	NO EFFECT	0.0	.0
		MUDEHMI FO FLOW/EXCHV FO	1	200.9304	0.02	.22800-02	EXPLOSIVE CONDITION	0.500	.11400-02
		MUDELOW STM PRES	1	200.9304	0.01	.11810-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.05430-03
		MUDEHMI STM PRES/STM DIMP ACT	1	200.9304	0.01	.11810-02	AUTO BACK-UP TAKES OVER	0.0	.0
		MUDEHMI STM PRES/SHUTTIME TIME	1	200.9304	0.04	.14270-03	EXPLOSIVE CONDITION	0.500	.71330-04
		MUDE=LOSS OF CONTROL/COMB CNTRL	1	200.9304	0.04	.13140-01	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.13140-02
		MUDE=LOSS AIR/FO RATIO/SHOVE	1	200.9304	0.03	.37020-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.37020-03
		MUDE=PROP AIR/FO /EXCHV FO	1	200.9304	0.03	.37020-02	EXPLOSIVE CONDITION	0.500	.10510-02
		MUDE=LOSS OF REMOTE MANUAL	1	200.9304	0.01	.09020-03	LOSS OF BACK-UP OR ALARM	0.200	.10940-03
		MUDEHMI COMBUST AIR/SHOVE	1	200.9304	0.14	.19220-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.19220-02
		MUDEHMI COMBUST AIR/FLAME OUT	1	200.9304	0.04	.12340-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12340-02
		MUDEHMI COMBUST AIR/LOW STEAM	1	200.9304	0.08	.11630-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.11630-02
		MUDEHMI COMBUST AIR/SHOVE	1	200.9304	0.01	.14240-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.14240-03
		MUDELOW COMBUST AIR/SHOVE	1	200.9304	0.10	.24400-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.24400-02
		MUDELOW COMBUST AIR/EXCHV FO	1	200.9304	0.06	.08000-02	EXPLOSIVE CONDITION	0.500	.08000-02
		MUDELOW COMBUST AIR/LOW STEAM	1	200.9304	0.02	.29700-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.11970-02
		MUDELOW COMBUST AIR/CLR TRIP	1	200.9304	0.03	.04130-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.17450-02
BLACK PARTS	5	FUNCTION VALVES	1.00	2	45.5200				
MIMEI		MUDELOW FO FLOW/LOW STM PRES	1	45.5200	0.30	.13060-01	ALARM/ACTIVATE REMOTE MANUAL	0.100	.13060-02
		MUDELOW FO FLOW/FLAME OUT	1	45.5200	0.15	.09540-02	CLR TRIP/CORRECT/RESTART CLR	0.400	.27410-02
		MUDEHMI FO FLOW/SHOVE	1	45.5200	0.05	.23230-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.23230-03
		MUDEHMI FO FLOW/HI STM PRES	1	45.5200	0.30	.13060-01	NO EFFECT	0.0	.0
		MUDEHMI FO FLOW/EXCHV FO	1	45.5200	0.20	.02410-02	EXPLOSIVE CONDITION	0.500	.04300-02

BLOCK PARTS	Q.C.	QTY	FUNCTION FAILURE FROM PART	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
4 FUNCTION RELAYS								
MODE 1	1.00	2	0.071A	0.12	.75510-04	ALARM/ACTIVATE REMOTE MANUAL	0.100	.75510-05
		1	0.071A	0.16	.10040-03	BLR TRIP/CORRECT/RESTART BLR	0.400	.40140-04
			0.071A	0.18	.11340-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.11340-04
			0.071A	0.09	.50440-04	NO EFFECT	0.0	.0
			0.071A	0.03	.18570-04	EXPLOSIVE CONDITION	0.500	.92450-05
			0.071A	0.20	.12630-03	AUTO CONTROL OUTPUT IS ERRATIC	0.100	.12430-04
			0.071A	0.10	.63130-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
			0.071A	0.04	.25300-04	ALARM/ACTIVATE REMOTE MANUAL	0.100	.25300-05
			0.071A	0.03	.19100-04	ALARM/ACTIVATE REMOTE MANUAL	0.100	.19100-05
			0.071A	0.03	.19100-04	MPC REDUCES RPM/CORRECT/RESUME	0.400	.78750-05
5 FUNCTION ACTUATORS								
MODE 1	1.00	2	34.0000	0.29	.48000-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.48000-03
		1	34.0000	0.05	.12230-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12230-03
			34.0000	0.10	.20450-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.97000-03
			34.0000	0.15	.34050-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.34050-03
			34.0000	0.05	.12230-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.12230-03
			34.0000	0.05	.12230-02	EXPLOSIVE CONDITION	0.500	.61100-03
			34.0000	0.10	.20450-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.97000-03
			34.0000	0.15	.34050-02	BLR TRIP/CORRECT/RESTART BLR	0.400	.14660-02
6 FUNCTION TRANSISTORS								
MODE 1	1.00	1	03.0001	0.16	.61490-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.61490-03
		1	03.0001	0.04	.49740-02	BLR TRIP/CORRECT/RESTART BLR	0.400	.16200-02
			03.0001	0.09	.42090-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.42090-03
			03.0001	0.07	.31700-02	NO EFFECT	0.0	.0
			03.0001	0.07	.31700-02	EXPLOSIVE CONDITION	0.500	.19500-02
			03.0001	0.11	.49010-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.49010-03
			03.0001	0.00	.36220-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.36220-03
			03.0001	0.00	.36220-02	MPC REDUCES RPM/CORRECT/RESUME	0.400	.18000-02
			03.0001	0.22	.98000-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.98000-03
			03.0001	0.05	.20910-02	EXPLOSIVE CONDITION	0.500	.12460-02
7 FUNCTION CONTROLLERS								
MODE 1	1.00	2	0.0120	0.15	.10440-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.10440-03
		1	0.0120	0.37	.26000-02	ALARM/ACTIVATE REMOTE MANUAL	0.100	.26000-03
			0.0120	0.07	.52000-03	MPC REDUCES RPM/CORRECT/RESUME	0.400	.26000-03
			0.0120	0.11	.70000-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.70000-04
			0.0120	0.12	.43010-03	ALARM/ACTIVATE REMOTE MANUAL	0.100	.43010-04
			0.0120	0.03	.20410-03	EXPLOSIVE CONDITION	0.500	.10200-03
			0.0120	0.06	.43510-03	MPC REDUCES RPM/CORRECT/RESUME	0.400	.10610-03
			0.0120	0.07	.62610-03	BLR TRIP/CORRECT/RESTART BLR	0.400	.25050-03

		D.C.	FUNCTION FAILURE PROB.	FAIL. MORE FREQ. RATIO	FAIL. MORE FAIL. PROB.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLACK PARTS	5	FUNCTION ELECTRONIC/DRUM LVL CHL	1.00	271.8355				
MODE1		MODEWHI DRUM LVL	1	271.8355	0.34	.7240D-01	0.100	.7240D-02
		MODEWHI DRUM LVL/SPILL TO THRU	1	271.8355	0.04	.8440D-02	0.500	.4272D-02
		MODELOW DRUM LVL/HI THRU	1	271.8355	0.25	.4447D-01	0.400	.1047D-01
		MODELOW DRUM LVL/HI STX TRIP	1	271.8355	0.12	.2341D-01	0.500	.1141D-01
		MODELOW DRUM LVL/HI STX TRIP	1	271.8355	0.04	.8440D-02	0.500	.4031D-02
		MODEFALSE ALARM	1	271.8355	0.05	.8435D-02	0.0	.0
		MODELOSS OF CONTROL/DRUM LVL	1	271.8355	0.10	.1944D-01	0.100	.1944D-02
BLACK PARTS	5	FUNCTION TRANSDUCERS	1.00	71.9400				
MODE1		MODEWHI DRUM LVL	1	71.9400	0.12	.5454D-02	0.100	.5454D-03
--- AN FI		REFER. SET MODEWZ CODE=342 ST=70.50.41	1	71.9400	0.04	.1787D-02	0.400	.7146D-03
		MODELOW DRUM LVL/SLP TRIP	1	71.9400	0.02	.6602D-03	0.500	.4341D-03
		MODELOW DRUM LVL/HI STX TRIP	1	71.9400	0.01	.3465D-03	0.500	.1533D-03
		MODELOW DRUM LVL/HI STX TRIP	1	71.9400	0.01	.4074D-01	0.100	.4074D-02
BLACK PARTS	5	FUNCTION ELECTRONIC/FW CHL	1.00	42.7669				
MODE1		MODELOW FO PRES/LOW DRUM	1	42.7669	0.51	.1540D-01	0.100	.1540D-02
		MODEWHI FO PRES/HI DRUM	1	42.7669	0.01	.2429D-03	0.200	.4858D-04
		MODEWHI FW PRESS/HI DRUM LVL	1	42.7669	0.10	.5481D-02	0.100	.5481D-03
		MODEWHI FW PRESS/HI DRUM LVL	1	42.7669	0.10	.5481D-02	0.700	.1837D-02
		MODELOSS OF CONTROL/FW PHV	1	42.7669	0.12	.3607D-02	0.100	.3607D-03
BLACK PARTS	5	FUNCTION TRANSDUCERS	1.00	37.5400				
MODE1		MODELOW FO PRES/LOW DRUM	1	37.5400	0.33	.4474D-02	0.100	.4474D-03
		MODEWHI FW PRESS/HI DRUM LVL	1	37.5400	0.17	.4447D-02	0.100	.4447D-03
		MODEWHI FW PRESS/HI DRUM LVL	1	37.5400	0.17	.4447D-02	0.700	.3127D-02
		MODELOSS OF CONTROL/FW PHV	1	37.5400	0.30	.4447D-02	0.100	.4447D-03
BLACK PARTS	7	FUNCTION ELECTRONIC/FW HECC VLV CHL	1.00	18.3752				
MODE1		MODEWHI HECC VLV CHL/ID DRUM	1	18.3752	0.15	.2429D-02	0.400	.4447D-03
		MODEWHI HECC VLV CHL/ID DRUM	1	18.3752	0.20	.2471D-02	0.0	.0
		MODEFALSE ALARM	1	18.3752	0.17	.1146D-02	0.0	.0
		MODEALARM FAILS	1	18.3752	0.32	.4144D-02	0.200	.4342D-03

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS MINNER MODULE

SYSTEM EFFECT	WFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF MINNER MOD FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION MINNER MOD CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
10 LOSS OF TRIP	1	.6501E-01	12.3121	3.3057	0.5000	.3140E-01	52.2511	8.7112
4 ALH TRIP/CORRECT/RESTART BLR	5	.3914E-01	7.4123	1.9981	0.4000	.1552E-01	25.4910	4.2498
5 ALARM/ACTIVATE REMOTE MANUAL	3	.1340	26.1298	7.9157	0.1000	.1353E-01	22.2570	3.7106
2 NO EFFECT	2	.3524E-01	6.6746	1.7921	0.0	.0	0.0	0.0
1 NOT APPLICABLE TO THIS PHASE	1	.2507	47.4712	12.7457	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMBUST ENCL/PLR AND LUC

SYSTEM EFFECT	WFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF COMBUST EN CL/PLR FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMBUST EN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
4 WFE REMOVES RPM/CORRECT/RESUME	5	.9475E-01	41.8315	2.0720	0.4000	.1412E-01	57.4750	4.4155
4 EXPLOSIVE CONDITION	7	.1914E-01	19.8447	0.9954	0.5000	.9637E-02	34.1182	2.6396
13 LOSS OF BACK-UP IN ALARM	14	.9344E-02	4.5462	0.4253	0.2000	.1644E-02	5.4972	0.4542
10 FALSE TURN OFF/CORRECT/RESTART	10	.1175E-02	1.2467	0.0544	0.7000	.0223E-03	2.9112	0.2247
5 AUTO BACK-UP TAKES OVER	2	.1930E-01	19.8447	0.9854	0.0	.0	0.0	0.0
14 FALSE ALARM	2	.9344E-02	4.5462	0.4253	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMBUSTION CONTINOL

SYSTEM EFFECT	WFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF COMBUSTION CONTINOL FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMBUSTION CONTINOL CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
5 ALARM/ACTIVATE REMOTE MANUAL	3	.1504	50.7445	7.0646	0.1000	.1510E-01	39.1343	4.2125
4 EXPLOSIVE CONDITION	7	.3644E-01	13.6477	1.9444	0.5000	.1510E-01	31.9433	4.3445
4 ALH TRIP/CORRECT/RESTART BLR	5	.7554E-01	9.7245	1.1012	0.4000	.1071E-01	21.1336	2.7443
4 WFE REMOVES RPM/CORRECT/RESUME	5	.1342E-01	5.1775	0.4024	0.4000	.5840E-02	11.3670	1.0297
12 AUTO CONTROL OUTPUT IS ERRATIC	3	.1339E-01	5.4024	0.6411	0.1000	.1331E-02	2.7646	0.3445
13 LOSS OF BACK-UP ON ALARM	14	.9475E-03	0.3707	0.0544	0.2000	.1944E-03	0.4172	0.0347
1 NOT APPLICABLE TO THIS PHASE	1	.6310E-01	0.0280	4.0032	0.0	.0	0.0	0.0
5 AUTO BACK-UP TAKES OVER	2	.1101E-02	0.4540	0.0500	0.0	.0	0.0	0.0
2 NO EFFECT	2	.2274E-01	4.4504	1.1504	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS BURNER MANAGEMENT/MASTER

SYSTEM EFFECT	SFF	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF BURNER MAN FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION TO BURNER MAN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
4 HUP TRIP/CONNECT/RESTART HUP		5	.0759E-01	19.5736	2.4100	0.4000	.1007E-01	50.7892	5.1600
16 LOSS OF TRIP		7	.1647E-01	14.0007	1.8503	0.5000	.1745E-01	48.3134	4.9160
3 ALARM/ACTIVATE REMOTE MANUAL		3	.1766E-02	0.7203	0.0800	0.1000	.1765E-03	0.4750	0.0003
6 HUP REDUCES PPM/CONNECT/RESUME		5	.1020E-03	0.1014	0.0200	0.4000	.1560E-03	0.4224	0.0030
1 NOT APPLICABLE TO THIS PHASE		1	.1500	40.5390	7.0702	0.0	.0	0.0	0.0

SYSTEM EFFECT	SFF	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
4 HUP TRIP/CONNECT/RESTART HUP		5	.2273	11.5500	11.5500	0.4000	.0002E-01	20.0560	20.0560
11 HUP ALARM--HUP LIGHT/INDICATION		7	.1200	0.5000	0.5000	0.5000	.0303E-01	17.4025	17.0025
16 LOSS OF TRIP		7	.1015	5.1000	5.1000	0.5000	.0075E-01	13.0277	13.0277
3 ALARM/ACTIVATE REMOTE MANUAL		3	.0000	25.2022	25.2022	0.1000	.0006E-01	13.3035	13.3035
6 EXPLOSIVE CONDITION		7	.0523E-01	0.2323	0.2323	0.5000	.0136E-01	11.3270	11.3270
8 HUP REDUCES PPM/CONNECT/RESUME		5	.0270E-01	3.1000	3.1000	0.4000	.0072E-01	6.7705	6.7705
13 LOSS OF BACK-UP HUP ALARM		14	.0403E-01	0.7013	0.7013	0.2000	.1005E-01	5.1000	5.1000
7 HUP TRIP--CONNECT/RESTART HUP		10	.1750E-01	0.0007	0.0007	0.7000	.1222E-01	3.3001	3.3001
12 AUTO CONTROL OUTPUT IS ERRATIC		3	.1070	0.0000	0.0000	0.3000	.1000E-01	2.9105	2.9105
10 FALSE TUNING TRIP/CONNECT/RESTART		10	.1175E-02	0.0500	0.0500	0.5000	.0222E-02	1.1500	1.1500
5 AUTO BACK-UP TAKES OVER		2	.0601E-01	0.3734	0.3734	0.7000	.0223E-03	0.2252	0.2252
10 FALSE ALARM		7	.2050E-01	1.5020	1.5020	0.0	.0	0.0	0.0
1 NOT APPLICABLE TO THIS PHASE		1	.0076	20.7201	20.7201	0.0	.0	0.0	0.0
2 NO EFFECT		2	.1147	5.0335	5.0335	0.0	.0	0.0	0.0

MISSION EFFECT CRITICALITY

MISSION EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PCT. OF SYSTEM FAILURE PROBABILITY	MISSION LOSS PROBABILITY	MISSION CRITICALITY	PERCENT CONTRIBUTION TO MISSION CRITICALITY
7 POSSIBLE HUP/TURN DAMAGE	1	.3730	10.02	.5000	.1502	43.50
5 TEMPORARY REDUCED RPM	2	.2000	14.73	.0000	.1147	31.43
1 SMALL PERFORMANCE DEGRADATION	3	.0030	10.60	.1000	.5051E-01	14.30
10 BACK-UP FAILURE	4	.0003E-01	0.701	.2000	.1000E-01	5.100
10 TEMPORARY DUN	5	.1007E-01	.0000	.7000	.1500E-01	3.571
1 NOT APPLICABLE/INITIAL STEERING	7	.0076	20.73	.0	.0	.0
2 NO EFFECT	10	.2303	11.71	.0	.0	.0

BLOCK PARTS	FUNCTION	U.C.	QTY	FUNCTION FAILURE PROB. FMT	FAIL. MODE PROB. RATIO	FAIL. MODE FAIL. PROB.	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
1	FUNCTION ELECTRONIC/ARMG NOT MET	1.00	2	13A, 1A02					
WIRES			1	13A, 1A02	0.04	.24670-03	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERBLOSS OF PURGE			13A, 1A02	0.01	.12350-04	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERHARDVENTENT PURGE			13A, 1A02	0.23	.62710-03	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERLIGHT-OFF LOGIC FAILURE			13A, 1A02	0.07	.26170-03	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERLOSS OF TRIP			13A, 1A02	0.01	.22110-04	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERHARDVENTENT PURGE			13A, 1A02	0.44	.14540-03	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERLOSS/INMEDIATE RECRC			13A, 1A02	0.11	.31220-03	NOT APPLICABLE TO THIS PHASE	0.0	.4
	UNDERFALSE TRIP			13A, 1A02	0.12	.34240-03	BLR TRIP/CORRECT/RESTART BLR	0.700	.21940-03
	UNDERFUTV CLOSERS OR CAUT OPEN			13A, 1A02	0.12	.34240-03	BLR TRIP/CORRECT/RESTART BLR	0.700	.21940-03
	UNDERFUTV CLOSERS OR CAUT OPEN			13A, 1A02	0.02	.46980-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERFUTV OPEN OR CAUT CLOSE			13A, 1A02	0.02	.46980-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERFUTV OPEN OR CAUT CLOSE			13A, 1A02	0.02	.46980-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERFUTV OPEN OR CAUT CLOSE			13A, 1A02	0.02	.46980-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERLOSS OF MOILED TRIP			13A, 1A02	0.04	.18740-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERLOSS OF PURGE TIMER			13A, 1A02	0.01	.35430-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERPURGE INITIATED/NO INHBT			13A, 1A02	0.01	.35430-04	BLR TRIP/CORRECT/RESTART BLR	0.700	.27480-04
	UNDERMAIN FLOW TO PURGE LEVEL			13A, 1A02	0.08	.11950-04	ALARM/ACTIVATE REMOTE MANUAL	0.000	.46130-05
	UNDERMAIN FLOW TO PURGE LEVEL			13A, 1A02	0.02	.55270-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERFLO FLD LTRFF LVL/LW STM			13A, 1A02	0.02	.55270-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERFLO FLD LTRFF LVL/LW STM			13A, 1A02	0.02	.55270-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
	UNDERFLO RECRC WITH FOTV CLOSED			13A, 1A02	0.00			0.0	.0
	UNDERFLO RECRC INHBT SUPPRESSED			13A, 1A02	0.00			0.0	.0

		D.C.	QTY	FUNCTION FAILURE PHEN. EFFECT	FAIL. MODE EFFECT RATIO	FAIL. MODE FAIL. PHEN.	SYSTEM EFFECT	MISSION LOSS FROM	MISSION CRITICALITY (C)
BLOCK PARTS	1								
MODULE	1	1.00	2	70.9200					
			1	70.9200	0.11	.14890-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				70.9200	0.09	.13850-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				70.9200	0.13	.14720-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				70.9200	0.07	.05130-03	LOSS OF TRIP	0.500	.47500-03
BLOCK PARTS	1								
MODULE	1	1.00	2	2.3000					
			1	2.3000	0.00	.40000-07	NOT APPLICABLE TO THIS PHASE	0.0	.0
				2.3000	0.01	.50700-06	NOT APPLICABLE TO THIS PHASE	0.0	.0
				2.3000	0.70	.91720-05	LOSS OF TRIP	0.500	.45000-05
				2.3000	0.70	.36370-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	1								
MODULE	1	1.00	2	131.0000					
			1	131.0000	0.50	.13100-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
				131.0000	0.75	.65500-03	BLR TRIP/CORRECT/RESTART BLR	0.700	.45000-03
				131.0000	0.25	.65500-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2								
MODULE	1	1.00	A	270.0000					
			1	270.0000	0.02	.12900-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.06	.30050-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.07	.30270-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.02	.10050-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.01	.03310-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.00	.05000-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.06	.41100-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.05	.27010-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.01	.34100-04	BLR TRIP/CORRECT/RESTART BLR	0.700	.37000-04
				270.0000	0.05	.20000-03	NO EFFECT	0.0	.0
				270.0000	0.01	.34100-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.01	.34100-04	ALARM/ACTIVATE REMOTE MANUAL	0.000	.32000-04
				270.0000	0.01	.34100-04	NO EFFECT	0.0	.0
				270.0000	0.01	.34100-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.20	.10770-02	ALARM/ACTIVATE REMOTE MANUAL	0.000	.00000-03
				270.0000	0.01	.34100-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
				270.0000	0.02	.07000-04	BLR TRIP/CORRECT/RESTART BLR	0.700	.00210-04
				270.0000	0.27	.10770-02	LOSS OF TRIP	0.500	.73000-03
				270.0000	0.02	.02030-04	LOSS OF TRIP	0.500	.40010-04

		O.C.	QTY	FUNCTION FAILURE PART	FAIL. MODE PART RATED	FAIL. MODE PART RATED	SYSTEM EFFECT	MISSION LOSS PARR.	MISSION CRITICALITY (C)
BLOCK PARTS	2	FUNCTION SWITCHES							
MODE1		1.00	4	144.6424					
			1	144.6424	0.14	.57620-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				144.6424	0.26	.07750-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				144.6424	0.07	.26130-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				144.6424	0.25	.01790-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.55070-03
				144.6424	0.14	.52620-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.31570-03
				144.6424	0.07	.26130-03	BLW TRIP/CORRECT/RESTART BLW	0.700	.40260-03
				144.6424	0.07	.26130-03	LOSS OF TRIP	0.500	.13060-03
BLOCK PARTS	2	FUNCTION VALVES							
MODE1		1.00	4	131.0400					
			1	131.0400	0.50	.13100-02	ALARM/ACTIVATE REMOTE MANUAL	0.600	.70570-03
				131.0400	0.50	.13100-02	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION RELAYS							
MODE1		1.00	4	17.2400					
			1	17.2400	0.53	.11520-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				17.2400	0.12	.01720-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				17.2400	0.21	.72750-04	NOT APPLICABLE TO THIS PHASE	0.0	.0
				17.2400	0.33	.11520-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION TRANSFORMERS							
MODE1		1.00	4	0.1600					
			1	0.1600	1.00	.32000-05	NOT APPLICABLE TO THIS PHASE	0.0	.0
BLOCK PARTS	2	FUNCTION ACTUATORS							
MODE1		1.00	4	137.9200					
			1	137.9200	0.25	.60940-03	BLW TRIP/CORRECT/RESTART BLW	0.700	.40260-03
				137.9200	0.25	.60940-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
				137.9200	0.25	.60940-03	NO EFFECT	0.0	.0
				137.9200	0.25	.60940-03	NOT APPLICABLE TO THIS PHASE	0.0	.0

		O.C.	QTY	FUNCTION FAILURE MODE FRST	FAIL. MODE FRST RATIO	FAIL. MODE FRST RATIO	SYSTEM EFFECT	WIRING LOSS PROB.	SYSTEM CAPABILITY (C)
RECUA PARTS	1	FUNCTION ELECTRONIC/COMBUST CNL RER ONLY LG	1.00	1	43.6735				
MODE1		MODE1-1 ST PRES	1	43.6735	0.32	.01250-03	MPC REDICES RPM/CORRECT/RESUME	0.700	.20400-03
		MODE1-1 ST PRES/STH DUMP ACT		43.6735	0.14	.17030-03	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE1-1 ST PRES/RIPTIME TIME		43.6735	0.14	.17030-03	EXPLOSIVE CONDITION	0.500	.04140-04
		MODE1-1 ST PRES/RIPTIME TIME		43.6735	0.14	.23540-03	FALSE ALARM	0.0	.0
		MODE1-1 ST PRES/RIPTIME TIME		43.6735	0.14	.23540-03	LOSS OF BACK-UP ON ALARM	0.400	.04230-04
		MODE1-1 ST PRES/RIPTIME TIME		43.6735	0.01	.33110-04	FALSE THRU TRIP/CORRECT/RESTART	0.900	.20400-04
BLOCK PARTS	3	FUNCTION TRANSDUCERS	1.00	1	73.5200				
MODE1		MODE1-1 ST PRES	1	73.5200	0.50	.33000-03	MPC REDICES RPM/CORRECT/RESUME	0.700	.51450-03
		MODE1-1 ST PRES/STH DUMP ACT		73.5200	0.25	.34750-03	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE1-1 ST PRES/RIPTIME TIME		73.5200	0.25	.34750-03	EXPLOSIVE CONDITION	0.500	.10300-03
RECUA PARTS	4	FUNCTION ELECTRONIC/COMBUST CNL	1.00	2	200.9304				
MODE1		MODE1-1 ST PRES	1	200.9304	0.00	.24110-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.10070-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.10070-03	GLR TRIP/CORRECT/RESTART ALR	0.700	.11250-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.30540-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.10320-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.15670-03	NO EFFECT	0.0	.0
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.02	.04300-04	EXPLOSIVE CONDITION	0.500	.32150-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.01	.32150-04	MPC REDICES RPM/CORRECT/RESUME	0.700	.22500-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.01	.32150-04	AUTO BACK-UP TAKES OVER	0.0	.0
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.00190-05	EXPLOSIVE CONDITION	0.500	.25400-05
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.17370-03	AUTO CONTROL OUTPUT IS ABNORM	0.600	.22720-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.03	.10470-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.02400-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.01	.18450-03	EXPLOSIVE CONDITION	0.500	.32240-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.01	.20130-04	LOSS OF BACK-UP ON ALARM	0.400	.11250-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.14	.30440-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.02180-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.30440-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.20970-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.32950-03	MPC REDICES RPM/CORRECT/RESUME	0.700	.21000-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.01	.00190-05	ALARM/ACTIVATE REMOTE MANUAL	0.600	.20110-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.10	.70710-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.02400-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.00	.22400-03	EXPLOSIVE CONDITION	0.500	.11450-03
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.02	.00390-04	MPC REDICES RPM/CORRECT/RESUME	0.700	.09070-04
		MODE1-1 ST PRES/STH DUMP ACT		200.9304	0.03	.12440-03	ALR TRIP/CORRECT/RESTART ALR	0.700	.07250-04

		D.F.	QTY	FUNCTION FAILURE PROB. FNCT	FAIL. MODE FNCT NATIO	FAIL. MODE FNCT NATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLACK PARTS	1	FUNCTION VALVES	1.00	2	45.5200				
MODE 1		UNDERFLOW FLOW/LOW STN PRES	1	45.5200	0.30	.30300-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.23500-03
		UNDERFLOW FLOW/FLAME OUT		45.5200	0.15	.19650-03	OLN TRIP/CORRECT/RESTART ALR	0.700	.13760-03
		UNDERFLOW FLOW/SMOKE		45.5200	0.05	.65520-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.30810-04
		UNDERFLOW FLOW/HI STN PRES		45.5200	0.30	.30300-03	NO EFFECT	0.0	.0
		UNDERFLOW FLOW/EXCESS FLOW		45.5200	0.20	.24200-03	EXPLOSIVE CONDITION	0.500	.13100-03
BLACK PARTS	4	FUNCTION RELAYS	1.00	2	0.8710				
MODE 1		UNDERFLOW FLOW/LOW STN PRES	1	0.8710	0.12	.21270-05	ALARM/ACTIVATE REMOTE MANUAL	0.600	.12760-05
		UNDERFLOW FLOW/FLAME OUT		0.8710	0.14	.20420-05	OLN TRIP/CORRECT/RESTART ALR	0.700	.10040-05
		UNDERFLOW FLOW/SMOKE		0.8710	0.14	.32000-05	ALARM/ACTIVATE REMOTE MANUAL	0.600	.19250-05
		UNDERFLOW FLOW/HI STN PRES		0.8710	0.09	.16000-05	NO EFFECT	0.0	.0
		UNDERFLOW FLOW/EXCESS FLOW		0.8710	0.03	.52310-04	EXPLOSIVE CONDITION	0.500	.26150-04
		UNDERFLOW OF CONTROL/COND FUEL		0.8710	0.20	.35570-05	AUTH CONTROL OUTPUT IS CAPTIVE	0.600	.21340-05
		UNDERFLOW OF PURGE/LOW AIR		0.8710	0.10	.17700-05	NOT APPLICABLE TO THIS PHASE	0.0	.0
		UNDERFLOW COMBUST AIR/SMOKE		0.8710	0.04	.71000-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.42490-04
		UNDERFLOW COMBUST AIR/FLAME OUT		0.8710	0.03	.54050-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.32030-04
		UNDERFLOW COMBUST AIR/LOW STEAM		0.8710	0.03	.54050-04	HPC REDUCES RPM/CORRECT/RESUME	0.700	.37800-04
BLACK PARTS	4	FUNCTION ACTUATORS	1.00	2	34.8400				
MODE 1		UNDERFLOW COMBUST AIR/SMOKE	1	34.8400	0.20	.13790-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.02750-04
		UNDERFLOW COMBUST AIR/FLAME OUT		34.8400	0.05	.34000-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.20690-04
		UNDERFLOW COMBUST AIR/LOW STEAM		34.8400	0.10	.60060-04	HPC REDUCES RPM/CORRECT/RESUME	0.700	.00270-04
		UNDERFLOW COMBUST AIR/SMOKE		34.8400	0.15	.14340-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.67060-04
		UNDERFLOW COMBUST AIR/EXCESS FLOW		34.8400	0.05	.34000-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.20690-04
		UNDERFLOW COMBUST AIR/EXCESS FLOW		34.8400	0.05	.34000-04	EXPLOSIVE CONDITION	0.500	.17240-04
		UNDERFLOW COMBUST AIR/LOW STN		34.8400	0.10	.60060-04	HPC REDUCES RPM/CORRECT/RESUME	0.700	.00270-04
		UNDERFLOW COMBUST AIR/LOW TRIP		34.8400	0.15	.14340-03	OLN TRIP/CORRECT/RESTART ALR	0.700	.72400-04

BLOCK PARTS	QTY	D.C.	FUNCTION FAILURE PROB. FEAT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
ALOCK PARTS	4	1.00	FUNCTION TRANSDUCERS					
MODEL :	1	1.00	MODEMHI FLOW/LOW STN PRES	0.18	.1737D-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.1442D-03
	1	1.00	MODEMHI FLOW/FLAME OUT	0.09	.1150D-03	BLR TRIP/CORRECT/RESTART RLP	0.200	.2300D-03
	1	1.00	MODEMHI FLOW/SMOKE	0.09	.1180D-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.7120D-00
	1	1.00	MODEMHI FLOW/STN PRES	0.07	.0943D-04	NO EFFECT	0.0	.0
	1	1.00	MODEMHI FLOW/EXCV FLOW	0.07	.0943D-04	EXPLOSIVE CONDITION	0.500	.4671D-04
	1	1.00	MODEMHI COMBUST AIR/SMOKE	0.11	.1367D-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.8202D-04
	1	1.00	MODEMHI COMBUST AIR/FLAME OUT	0.08	.1022D-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.6132D-04
	1	1.00	MODEMHI COMBUST AIR/LOW STEAM	0.08	.1022D-03	HPC REDUCES RPM/CORRECT/RESUME	0.700	.7150D-04
	1	1.00	MODEMHI COMBUST AIR/SMOKE	0.22	.2798D-03	ALARM/ACTIVATE REMOTE MANUAL	0.600	.1679D-03
	1	1.00	MODEMHI COMBUST AIR/EXCV FLOW	0.05	.7027D-04	EXPLOSIVE CONDITION	0.500	.3513D-04
ALOCK PARTS	4	1.00	FUNCTION CONTROLLERS					
MODEL :	1	1.00	MODEMHI COMBUST AIR/SMOKE	0.15	.2950D-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.1772D-04
	1	1.00	MODEMHI COMBUST AIR/FLAME OUT	0.57	.7350D-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.4013D-04
	1	1.00	MODEMHI COMBUST AIR/LOW STEAM	0.07	.1467D-04	HPC REDUCES RPM/CORRECT/RESUME	0.700	.1027D-04
	1	1.00	MODEMHI COMBUST AIR/SMOKE	0.11	.2200D-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.1328D-04
	1	1.00	MODEMHI COMBUST AIR/SMOKE	0.12	.2310D-04	ALARM/ACTIVATE REMOTE MANUAL	0.600	.1800D-04
	1	1.00	MODEMHI COMBUST AIR/EXCV FLOW	0.03	.5749D-05	EXPLOSIVE CONDITION	0.500	.2876D-05
	1	1.00	MODEMHI COMBUST AIR/LOW STN	0.06	.1170D-04	HPC REDUCES RPM/CORRECT/RESUME	0.700	.1977D-04
	1	1.00	MODEMHI COMBUST AIR/BLR TRIP	0.09	.1740D-04	BLR TRIP/CORRECT/RESTART RLP	0.700	.1235D-04
ALOCK PARTS	5	1.00	FUNCTION ELECTRONIC/DRUM LVL CHTI					
MODEL :	1	1.00	MODEMHI DRUM LVL	0.39	.2131D-02	ALARM/ACTIVATE REMOTE MANUAL	0.600	.1279D-02
	1	1.00	MODEMHI DRUM LVL/SPILL TH TURN	0.04	.2380D-03	LOSS OF PROTECTIVE FEATURE	0.500	.1170D-03
	1	1.00	MODEMHI DRUM LVL/BLR TRIP	0.25	.1145D-02	BLR TRIP/CORRECT/RESTART RLP	0.700	.9410D-03
	1	1.00	MODEMHI DRUM LVL/HI STN TEMP	0.12	.6729D-03	EXPLOSIVE CONDITION	0.500	.3365D-03
	1	1.00	MODEMHI DRUM LVL/HI BLR TEMP	0.04	.2260D-03	EXPLOSIVE CONDITION	0.500	.1140D-03
	1	1.00	MODEMHI FALSE ALARM	0.05	.2403D-03	FALSE ALARM	0.0	.0
	1	1.00	MODEMHI LOSS OF CONTROL/DRUM LVL	0.10	.3440D-03	AUTO CONTROL OUTPUT IS ERRATIC	0.600	.3387D-03

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMMIST CNTL/RLR AND LCC

SFE	SYSTEM EFFECT	WE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF CONTRIBUTION FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMMIST CN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
34	HPC REDUCES HP/CONNECT/RESUME	34	.1100E-02	41.8314	2.0720	0.7000	.4612E-03	66.9267	3.7354
36	EXPLOSIVE CONDITION	37	.5450E-13	19.8987	0.9050	0.5000	.2729E-03	22.7391	1.2643
43	LOSS OF BACK-UP IN ALARM	40	.2350E-03	8.5002	0.4253	0.4000	.9473E-04	7.0513	0.4383
40	FALSE TURN TRIP/CONNECT/RESTART	40	.3311E-04	1.2067	0.8500	0.9000	.2980E-04	2.4079	0.1366
35	AUTO BACK-UP TAKES OVER	37	.5850E-03	19.8987	0.9050	0.0	.0	0.0	0.0
44	FALSE ALARM	32	.2350E-03	8.5002	0.4253	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMMISTION CONTROL

SFE	SYSTEM EFFECT	WE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF CONTRIBUTION FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMMISTION CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
33	ALARM/ACTIVATE REMOTE MANUAL	33	.4030E-02	54.3966	7.2700	0.6000	.7410E-02	59.9375	11.2045
34	HPC REDUCES HP/CONNECT/RESUME	35	.7131E-03	9.6256	1.2073	0.7000	.4091E-03	17.3747	2.3215
36	EXPLOSIVE CONDITION	37	.4044E-03	11.4477	1.5604	0.5000	.4322E-03	19.7144	2.4191
30	RLR TRIP/CONNECT/RESTART RLR	35	.6050E-03	8.1772	1.0936	0.7000	.0240E-03	10.5130	1.4723
42	AUTO CONTROL OUTPUT IS ERRATIC	33	.3773E-03	5.0928	0.6511	0.6000	.2263E-03	5.4115	1.0527
40	RLR TRIP/CONNECT/RESTART BLR	23	.1150E-03	1.5520	0.2076	0.2000	.7300E-04	0.5701	0.1070
43	LOSS OF BACK-UP IN ALARM	44	.2013E-03	0.3797	0.0509	0.4000	.1125E-04	0.2790	0.0321
35	NOT APPLICABLE TO THIS PHASE	31	.1770E-05	0.0240	0.0032	0.0	.0	0.0	0.0
32	NO EFFECT	32	.6400E-03	8.6596	1.1569	0.0	.0	0.0	0.0
35	AUTO BACK-UP TAKES OVER	32	.3215E-04	0.4340	0.0500	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS HUNNER MANAGEMENT/MASTER

SFE	SYSTEM EFFECT	WE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF HUNNER MAN FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION HUNNER MAN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
30	RLR TRIP/CONNECT/RESTART RLR	35	.1379E-02	20.1335	2.4444	0.7000	.9653E-03	64.4511	4.0005
46	LOSS OF TRIP	37	.1027E-02	14.0007	1.0503	0.5000	.5130E-03	30.3000	2.1079
34	HPC REDUCES HP/CONNECT/RESUME	35	.1100E-04	0.1614	0.0200	0.7000	.7730E-05	0.5103	0.0360
33	ALARM/ACTIVATE REMOTE MANUAL	33	.1105E-04	0.1614	0.0200	0.6000	.6633E-05	0.4422	0.0300
31	NOT APPLICABLE TO THIS PHASE	31	.4420E-02	64.5600	7.9702	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS BURNER MODELS

REF	SYSTEM EFFECT	REF NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF BURNER MOD FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION TO BURNER MOD CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
33	ALARM/ACTIVATE REMOTE MANUAL	33	.1888E-02	26.1298	7.9157	0.0000	.2531E-02	54.0162	14.8883
34	LOSS OF TRIP	34	.1031E-02	12.3127	3.3057	0.0000	.9151E-03	22.7705	4.2541
35	BLW TRIP/CONNECT/RESTART BLW	35	.1102E-02	7.4124	5.9901	0.7400	.7715E-03	19.2055	3.5884
36	NOT APPLICABLE TO THIS PHASE	36	.7001E-02	47.9712	12.7857	0.0	0.0	0.0	0.0
37	NO EFFECT	37	.0024E-03	4.6746	1.7921	0.0	0.0	0.0	0.0

OFF	SYSTEM EFFECT	HEF NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
33	ALARM/ACTIVATE REMOTE MANUAL	33	.1359E-01	24.5175	24.5375	0.0000	.0153E-02	37.9182	37.9182
34	HLR TRIP/CORRECT/RESTART HLR	35	.5467E-02	10.2304	10.2304	0.7000	.3964E-02	10.0461	10.0461
41	NO ALARM--ONLY LIGHT/INDICATION	37	.3456E-02	6.5990	6.5990	0.5000	.1027E-02	0.0075	0.0075
47	ALRM CONTROL OUTPUT IS ERRATIC	34	.3434E-02	5.4700	5.4700	0.6000	.1027E-02	0.0075	0.0075
48	HLR REMOVES HRP/CORRECT/RESUME	35	.2084E-02	3.7610	3.7610	0.7000	.1458E-02	6.7010	6.7010
46	LOSS OF TRIP	37	.2459E-02	5.1600	5.1600	0.5000	.1020E-02	0.0000	0.0000
36	EXPLOSIVE CONDITION	37	.2745E-02	4.2323	4.2323	0.5000	.1172E-02	0.0019	0.0019
43	LOSS OF BACK-UP ON ALARM	44	.2649E-02	4.7011	4.7011	0.4000	.1059E-02	4.9266	4.9266
37	TURN TRIP--CORRECT/RESTART ALW	40	.0929E-03	0.0007	0.0007	0.0000	.0030E-03	2.0031	2.0031
50	LOSS OF PROTECTIVE FEATURE	37	.2109E-03	0.0312	0.0312	0.5000	.1104E-03	0.0050	0.0050
40	FALSE TURN TRIP/CORRECT/RESTART	40	.3111E-04	0.0590	0.0590	0.0000	.2000E-04	0.1376	0.1376
44	HLR TRIP/CORRECT/RESTART HLR	23	.1150E-03	0.2076	0.2076	0.2000	.2100E-04	0.1070	0.1070
10	FALSE ALARM	2	.2043E-03	0.0010	0.0010	0.0	0.0	0.0	0.0
31	NOT APPLICABLE IN THIS PHASE	31	.1224E-01	22.1321	22.1321	0.0	0.0	0.0	0.0
32	NO EFFECT	32	.3752E-02	5.0335	5.0335	0.0	0.0	0.0	0.0
35	AUTO BACK-UP TAKES OVER	32	.2423E-02	4.3734	4.3734	0.0	0.0	0.0	0.0
44	FALSE ALARM	32	.0707E-03	0.0006	0.0006	0.0	0.0	0.0	0.0

MISSION EFFECT CRITICALITY

MISSION EFFECT	NO.	SYSTEM EFFECT FAILURE PROBABILITY	PCT. OF SYSTEM FAILURE PROBABILITY	MISSION LOSS PROBABILITY	MISSION CRITICALITY	PERCENT CONTRIBUTION TO MISSION CRITICALITY
33 SMALL PERFORMANCE DEGRADATION	1	.1663E-01	10.07	0.0000	.0073E-02	46.30
35 TEMPORARY REDUCED RPMs	2	.7751E-02	13.99	.7000	.5474E-02	25.23
37 POSSIBLE HLR/TURN DAMAGE	3	.4690E-02	10.42	.5000	.0507E-02	21.15
40 BACK-UP FAILURE	4	.2649E-02	4.701	.0000	.1059E-02	4.927
40 TEMPORARY DTH	5	.5260E-03	0.005	.0000	.0714E-03	2.202
23 SLIGHT DELAY IN LIGHT-OFF	6	.1150E-03	0.2076	.2000	.2100E-04	1.070
31 NOT APPLICABLE/HANDHEVERING	31	.1224E-01	22.13	0.0	0.0	0.0
32 NO EFFECT	32	.4125E-02	11.06	0.0	0.0	0.0
2 NO EFFECT	35	.2043E-03	0.0010	0.0	0.0	0.0

		D.C.	QTY	FUNCTION FAILURE MODE, PART	FAIL. MODE, PART, RATIO	FAIL. MODE, PART, RATIO	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	1	FUNCTION ELECTRONIC/PMW NGT NST	1.00	2	134,1402				
MODE1		MODE=LOSS OF PURGE	1	134,1402	0.49	.9037n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.3615n-02
		MODE=INADVERTENT PURGE		134,1402	0.01	.7059n-03	LIGHT-OFF INHIBITS OR ABORTED	0.400	.7023n-03
		MODE=LIGHT-OFF LOGIC FAILURE		134,1402	0.23	.2264n-01	LIGHT-OFF INHIBITS OR ABORTED	0.400	.4055n-02
		MODE=LOSS OF TRIP		134,1402	0.07	.7137n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.2935n-02
		MODE=INADVERTENT PURGE		134,1402	0.01	.8044n-03	LIGHT-OFF INHIBITS OR ABORTED	0.400	.3227n-03
		MODE=LOSS/INADEQUATE RECRC		134,1402	0.44	.6034n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.2414n-02
		MODE=FALSE TRIP		134,1402	0.11	.1133n-01	LIGHT-OFF INHIBITS OR ABORTED	0.400	.4534n-02
		MODE=FUTV CLOSES OR CANT OPEN		134,1402	0.12	.1243n-01	LIGHT-OFF INHIBITS OR ABORTED	0.400	.4972n-02
		MODE=FUTV CLOSES OR CANT OPEN		134,1402	0.12	.1243n-01	LIGHT-OFF INHIBITS OR ABORTED	0.400	.4972n-02
		MODE=FUTV OPEN OR CANT CLOSE		134,1402	0.02	.1713n-02	EXPLOSIVE CONDITION	0.500	.4567n-03
		MODE=FUTV OPEN OR CANT CLOSE		134,1402	0.02	.1713n-02	EXPLOSIVE CONDITION	0.500	.4567n-03
		MODE=FUTV OPEN OR CANT CLOSE		134,1402	0.02	.1713n-02	EXPLOSIVE CONDITION	0.500	.4567n-03
		MODE=LOSS OF BOILER TRIP		134,1402	0.02	.2414n-02	LOSS OF TRIP	0.500	.1209n-02
		MODE=LOSS OF PURGE TIMER		134,1402	0.00	.3024n-02	EXPLOSIVE CONDITION	0.500	.1943n-02
		MODE=PURGE INITIATED/NO INHIB		134,1402	0.00	.3024n-03	EXPLOSIVE CONDITION	0.500	.1513n-03
		MODE=AIR FLOW TO PURGE LEVEL		134,1402	0.01	.1310n-02	EXPLOSIVE CONDITION	0.500	.6542n-03
		MODE=NO FLO LTRFF LVL/NO FLAME		134,1402	0.01	.1411n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.5445n-03
		MODE=NO FLO LTRFF LVL/NO FLAME		134,1402	0.00	.4034n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=NO RECRC WITH FUTV CLOSED		134,1402	0.00	.4034n-03	NOT APPLICABLE TO THIS PHASE	0.0	.0
		MODE=NO RECRC INHIB SUPPRESSFO		134,1402	0.02	.2015n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.8062n-03
					0.00	.2017n-03	LIGHT-OFF INHIBITS OR ABORTED	0.400	.8049n-04
BLOCK PARTS	1	FUNCTION SWITCHES	1.00	2	70,9200				
MODE1		MODE=LOSS OF PURGE	1	70,9200	0.11	.5021n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.7140n-02
		MODE=LOSS OF TRIP		70,9200	0.09	.4732n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.1901n-02
		MODE=LOSS/INADEQUATE RECRC		70,9200	0.13	.6011n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.2324n-02
		MODE=LOSS OF BOILER TRIP		70,9200	0.47	.3014n-01	LOSS OF TRIP	0.500	.1707n-01
BLOCK PARTS	1	FUNCTION RELAYS	1.00	2	2,3044				
MODE1		MODE=LOSS OF PURGE	1	2,3044	0.40	.1682n-05	LIGHT-OFF INHIBITS OR ABORTED	0.400	.6729n-06
		MODE=FALSE TRIP		2,3044	0.01	.1051n-04	LIGHT-OFF INHIBITS OR ABORTED	0.400	.7402n-05
		MODE=LOSS OF BOILER TRIP		2,3044	0.70	.3347n-03	LOSS OF TRIP	0.500	.1670n-03
		MODE=NO RECRC WITH FUTV CLOSED		2,3044	0.70	.1327n-02	LIGHT-OFF INHIBITS OR ABORTED	0.400	.5304n-03
BLOCK PARTS	1	FUNCTION VALVES	1.00	2	131,0400				
MODE1		MODE=LOSS/INADEQUATE PURGE	1	131,0400	0.50	.4670n-01	LIGHT-OFF INHIBITS OR ABORTED	0.400	.1068n-01
		MODE=FUTV CLOSES OR CANT OPEN		131,0400	0.25	.2363n-01	LIGHT-OFF INHIBITS OR ABORTED	0.400	.4052n-02
		MODE=FUTV OPEN OR CANT CLOSE		131,0400	0.25	.2363n-01	EXPLOSIVE CONDITION	0.500	.1742n-01

BLOCK PARTS	Q.C.	QTY	FUNCTION FAILURE PROB. PPM.	FAIL. RATE	FAIL. MODE	SYSTEM EFFECT	MISSION LOSS PROB.	MISSION CRITICALITY (C)
BLOCK PARTS	2	1.00	4	270,645A				
MODE1			1	270,645A	0.02	.47310-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.10920-02
			1	270,645A	0.04	.11200-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.44000-02
			1	270,645A	0.07	.13150-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.52610-02
			1	270,645A	0.02	.39000-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.15700-02
			1	270,645A	0.01	.15000-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.43100-03
			1	270,645A	0.08	.16000-01 EXPLOSIVE COMBUSTION	0.500	.02310-02
			1	270,645A	0.00	.16010-01 EXPLOSIVE COMBUSTION	0.500	.05510-02
			1	270,645A	0.05	.16030-01 EXPLOSIVE COMBUSTION	0.500	.30100-02
			1	270,645A	0.01	.19700-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.70400-03
			1	270,645A	0.05	.00000-02 EXPLOSIVE COMBUSTION	0.500	.05200-02
			1	270,645A	0.01	.19700-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.70400-03
			1	270,645A	0.01	.19700-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.70400-03
			1	270,645A	0.01	.19700-02 EXPLOSIVE COMBUSTION	0.500	.00700-03
			1	270,645A	0.01	.19700-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.70400-03
			1	270,645A	0.20	.30500-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.15420-01
			1	270,645A	0.01	.19700-02 EXPLOSIVE COMBUSTION	0.500	.00700-03
			1	270,645A	0.02	.35500-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.14200-02
			1	270,645A	0.27	.52520-01 LOSS OF TRIP	0.500	.26200-01
			1	270,645A	0.02	.37500-02 LOSS OF TRIP	0.500	.16770-02
BLOCK PARTS	2	1.00	4	100,642A				
MODE1			1	100,642A	0.10	.19030-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.70110-02
			1	100,642A	0.20	.35070-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.10830-01
			1	100,642A	0.07	.00020-02 EXPLOSIVE COMBUSTION	0.500	.07000-02
			1	100,642A	0.25	.32000-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.13100-01
			1	100,642A	0.10	.19030-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.70110-02
			1	100,642A	0.07	.00020-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.07000-02
			1	100,642A	0.07	.00020-02 LOSS OF TRIP	0.500	.07000-02
BLOCK PARTS	2	1.00	4	131,000A				
MODE1			1	131,000A	0.50	.00700-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.10000-01
			1	131,000A	0.50	.00700-01 EXPLOSIVE COMBUSTION	0.500	.23150-01
BLOCK PARTS	2	1.00	4	17,200A				
MODE1			1	17,200A	0.33	.01950-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.16700-02
			1	17,200A	0.12	.15220-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.00700-03
			1	17,200A	0.21	.20520-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.10010-02
			1	17,200A	0.33	.01950-02 LIGHT-OFF INHIBITS OR ABORTED	0.400	.16700-02
BLOCK PARTS	2	1.00	4	0,1000				
MODE1			1	0,1000	1.00	.11600-03 LIGHT-OFF INHIBITS OR ABORTED	0.400	.03720-04
BLOCK PARTS	2	1.00	4	137,0200				
MODE1			1	137,0200	0.25	.20000-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.00030-02
			1	137,0200	0.25	.20000-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.00030-02
			1	137,0200	0.25	.20000-01 EXPLOSIVE COMBUSTION	0.500	.12050-01
			1	137,0200	0.25	.20000-01 LIGHT-OFF INHIBITS OR ABORTED	0.400	.00030-02

BLOCK PARTS	Q.C.	QTY	FUNCTION FAILURE PRIM. FRAT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PRIM.	MISSION CRITICALITY (C)
2	FUNCTION ELECTRONIC/COMMIST CNTL CLR AND LO	1.00	1	43.6739				
MODE1	MODE=LOW STN PRES		1	43.6739	0.32	.14940-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI STN PRES/STN DIMP ACT			43.6739	0.14	.04860-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI STN PRES/STN DIMP THIRP			43.6739	0.14	.04860-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=FALSE ALARM			43.6739	0.19	.04820-02	FALSE ALARM	0.200
	MODE=ALARM FAILS			43.6739	0.19	.05020-02	LOSS OF BACK-UP OR ALARM	0.400
	MODE=FALSE TURNING TRIP			43.6739	0.03	.12020-02	NOT APPLICABLE TO THIS PHASE	0.0
3	FUNCTION TRANSDUCERS	1.00	1	73.5200				
MODE1	MODE=LOW STN PRES		1	73.5200	0.50	.24480-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI STN PRES/STN DIMP ACT			73.5200	0.25	.13330-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI STN PRES/STN DIMP THIRP			73.5200	0.25	.13330-01	NOT APPLICABLE TO THIS PHASE	0.0
4	FUNCTION ELECTRONIC/COMMIST CNTL	1.00	2	200.9300				
MODE1	MODE=LOW FV FLO/LOW STN PRES		1	200.9300	0.04	.07420-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW FV FLO/FLAME OUT			200.9300	0.04	.07500-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI FV FLO/SHORE			200.9300	0.04	.11090-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI FV FLO/SHORE STN PRES			200.9300	0.04	.07040-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI FV FLO/EXCESS FV			200.9300	0.02	.23440-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW STN PRES			200.9300	0.01	.11730-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI STN PRES/STN DIMP ACT			200.9300	0.01	.11730-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI STN PRES/STN DIMP THIRP			200.9300	0.00	.14670-03	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOSS OF CONTROL/COMM CNTL			200.9300	0.00	.13550-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HIGH AIR/FV RATIO/SHORE			200.9300	0.03	.34670-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HIGH AIR/FV EXCESS FV			200.9300	0.03	.34670-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOSS OF REMOTE MANUAL			200.9300	0.01	.10260-02	LOSS OF BACK-UP OR ALARM	0.400
	MODE=HI COMBUST AIR/SHORE			200.9300	0.14	.11750-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI COMBUST AIR/FLAME OUT			200.9300	0.00	.12540-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI COMBUST AIR/LOW STEAM			200.9300	0.04	.11940-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI COMBUST AIR/SHORE			200.9300	0.01	.10460-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW COMBUST AIR/SHORE			200.9300	0.16	.23470-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW COMBUST AIR/EXCESS FV			200.9300	0.00	.03260-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW COMBUST AIR/LOW STEAM			200.9300	0.02	.34760-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW COMBUST AIR/CLR TRIP			200.9300	0.03	.05370-02	NOT APPLICABLE TO THIS PHASE	0.0
5	FUNCTION VALVES	1.00	2	45.5200				
MODE1	MODE=LOW FV FLO/LOW STN PRES		1	45.5200	0.30	.14250-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=LOW FV FLO/FLAME OUT			45.5200	0.15	.07490-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI FV FLO/SHORE			45.5200	0.45	.23040-02	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI FV FLO/SHORE STN PRES			45.5200	0.30	.14250-01	NOT APPLICABLE TO THIS PHASE	0.0
	MODE=HI FV FLO/EXCESS FV			45.5200	0.20	.05200-02	NOT APPLICABLE TO THIS PHASE	0.0

BLOCK PARTS	D.C. QTY	FUNCTION FROM FRST	FAIL. MODE FREQ. RATIO	FATH. MODE FATH. RATIO	SYSTEM EFFECT	MISSION LOSS PDRN.	MISSION CRITICALITY (C)
4 FUNCTION TRANSDUCERS	1.00	1	43.0001				
MODEMI		1	43.0001	0.10	43220-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.40	41000-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.00	43270-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.07	32500-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.07	32500-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.11	40770-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.08	37200-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.00	37200-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.22	10140-01	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	43.0001	0.05	25620-02	NOT APPLICABLE TO THIS PHASE	0.0
4 FUNCTION CONTROLLERS	1.00	2	0.0120				
MODEMI		1	0.0120	0.15	10700-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.17	20010-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.07	33530-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.11	00200-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.12	05350-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.03	20000-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.00	42600-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0120	0.00	04380-03	NOT APPLICABLE TO THIS PHASE	0.0
5 FUNCTION ELECTRONIC/DRUM LVL CNTL	1.00	2	271.0355				
MODEMI		1	271.0355	0.30	70920-01	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	271.0355	0.00	00010-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	271.0355	0.25	07050-01	LIGHT-OFF INHIBITS ON ABORTED	0.000
MODEMI		1	271.0355	0.12	20270-01	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	271.0355	0.00	02000-02	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	271.0355	0.05	00770-02	FALSE ALARM	0.200
MODEMI		1	271.0355	0.10	20000-01	AUTO CONTROL OUTPUT IS ZEPATIC	0.200
4 FUNCTION RELAYS	1.00	2	0.0710				
MODEMI		1	0.0710	0.12	77000-00	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.16	00370-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.10	11710-03	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.09	00050-00	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.03	10000-00	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.20	12000-00	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.10	00010-00	EXPLOSIVE CONDITION	0.500
MODEMI		1	0.0710	0.04	20000-00	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.03	10730-00	NOT APPLICABLE TO THIS PHASE	0.0
MODEMI		1	0.0710	0.03	10730-00	NOT APPLICABLE TO THIS PHASE	0.0

BLOCK	PARTS	D.C.	QTY	FUNCTION FAILURE PHEN. EFFECT	FAIL. MODE FREQ. RATIO	FAIL. MODE FREQ. RATIO	SYSTEM EFFECT	MISSION LOSS PROM.	MISSION CRITICALITY (C)
4	FUNCTION ACTUATORS								
1.00	2	34.4000							
1	1	34.4000							
MODEMI COMBUST AIR/SMOKE		0.20	.50210-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODEMI COMBUST AIR/FLAME OUT		0.05	.12500-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODEMI COMBUST AIR/LOW STEAM		0.10	.25100-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODEMI COMBUST AIR/SMOKE		0.15	.37600-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODELOW COMBUST AIR/EXCESS FQ		0.05	.12500-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODELOW COMBUST AIR/EXCESS FQ		0.05	.12500-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODELOW COMBUST AIR/LOW STEAM		0.10	.25100-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			
MODELOW COMBUST AIR/LOW STEAM		0.15	.37600-02	NOT APPLICABLE TO THIS PHASE	0.0	.0			

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS NUMBER MANAGEMENT/MASTER

SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF GROUPS WITH FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION NUMBER 24 CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
77 LIGHT-ONF INHIBITS OR SHORTED	24	.1771	70.8347	0.7575	0.4000	.7042E-01	66.2830	10.4992
78 LOSS OF TRIP	25	.3749E-01	10.4407	1.0543	0.3000	.1049E-01	17.4630	3.8622
66 EXPLOSIVE CONDITION	25	.3041E-01	13.0037	1.7115	0.3000	.1711E-01	16.2422	3.4917
61 NOT APPLICABLE TO THIS PHASE	21	.0070E-01	0.3220	0.0390	0.0	.0	0.0	0.0

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS NUMBER MODULE

SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF GROUPS WITH FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION NUMBER 24 CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
77 LIGHT-ONF INHIBITS OR SHORTED	24	.3388	62.8624	16.7544	0.4000	.1337	57.1039	27.0827
66 EXPLOSIVE CONDITION	25	.1373	25.2054	8.7490	0.5000	.6772E-01	27.9335	14.1745
78 LOSS OF TRIP	25	.6688E-01	12.3121	3.3057	0.5000	.3268E-01	13.7026	4.4821

SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMBUST CNL/MLR DMD LOC

SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF COMBUST CN CRITICALITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION COMBUST CN CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
73 LOSS OF BACK-UP OR ALARM	24	.4500E-02	0.7007	0.4255	0.4000	.3425E-02	64.6667	6.7170
74 FALSE ALARM	25	.4500E-02	0.7007	0.4255	0.2000	.1712E-02	33.3333	0.3545
61 NOT APPLICABLE TO THIS PHASE	21	.4200E-01	42.8277	4.1025	0.0	.0	0.0	0.0

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SYSTEM EFFECT CRITICALITY SUMMARY FOR ALL GROUPS VS COMBUSTION CONTROL

SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	73 LOSS OF BACK-UP OR ALARM	24	.1077E-02	0.3797	0.0500	0.0000	.0105E-03	52.4730	0.0050
	64 EXPLOSIVE CONDITION	25	.0001E-04	0.0200	0.0032	0.5000	.3200E-06	7.3270	0.0000
	45 NOT APPLICABLE TO THIS PHASE	21	.2003	90.5003	13.3105	0.0	.0	0.0	0.0

SFE	SYSTEM EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	PERCENT OF ALL GROUPS FAILURE PROBABILITY	MISSION LOSS PROB.	SYSTEM CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY	PERCENT OF CONTRIBUTION TO ALL GROUPS CRITICALITY
	77 LIGHT-OFF IMITRITS OF ABORTED	28	.4300	31.1000	31.1000	0.0000	.2000	52.1260	52.1260
	64 EXPLOSIVE CONDITION	25	.1010	0.0010	0.0010	0.5000	.0000E-01	19.0000	19.0000
	74 LOSS OF TRIP	24	.1003	0.1000	0.1000	0.5000	.5113E-01	10.7003	10.7003
	73 LOSS OF BACK-UP OR ALARM	24	.0000E-01	0.7013	0.7013	0.0000	.3050E-01	0.0271	0.0271
	72 AUTO CONTROL OUTPUT IS ERRATIC	23	.0703E-01	0.7000	0.7000	0.2000	.1015E-01	0.0003	0.0003
	30 RLP TRIP/CORRECT/RESTART RLP	35	.1000E-01	0.0220	0.0220	0.7000	.1300E-01	2.7207	2.7207
	70 FALSE ALARM	23	.3039E-01	1.5020	1.5020	0.2000	.0053E-02	1.2073	1.2073
	63 ALARM/ACTIVATE REMOTE MANUAL	24	.1025E-01	0.5072	0.5072	0.0000	.0001E-02	0.0566	0.0566
	67 INRM TRIP--CORRECT/RESTART RLP	23	.1025E-01	0.5072	0.5072	0.2000	.7000E-02	0.0203	0.0203
	61 NOT APPLICABLE TO THIS PHASE	21	.0002	30.7720	30.7720	0.0	.0	0.0	0.0
	62 NO EFFECT	22	.5020E-02	0.2002	0.2002	0.0	.0	0.0	0.0
	65 AUTO BACK-UP TAKES OVER	22	.2170E-01	1.0773	1.0773	0.0	.0	0.0	0.0

Chart

MISSION EFFECT CRITICALITY

MISSION EFFECT	SFE NO.	SYSTEM EFFECT FAILURE PROBABILITY	PCT. OF SYSTEM FAILURE PROBABILITY	MISSION LOSS PROBABILITY	MISSION CRITICALITY	PERCENT CONTRIBUTION TO MISSION CRITICALITY
20 DELAY IN LIGHT-OFF	1	.7370	30.40	.0000	.7014	41.01
25 POSSIBLE NOISE DAMAGE	2	.2003	10.05	.0000	.1000	30.50
73 SLIGHT DELAY IN LIGHT-OFF	3	.1377	0.004	.2000	.2720E-01	5.700
30 TEMPORARY REDUCED RPMs	4	.1000E-01	.0220	.7000	.1300E-01	2.721
21 NOT APPLICABLE TO THIS PHASE	21	.0002	30.77	.0	.0	0.0
22 NO EFFECT	22	.2700E-01	1.305	.0	.0	0.0